DRIVER IMPROVEMENT AS POST-LICENSING CONTROL:

THE STATE OF KNOWLEDGE

Alan C. Donelson

D.R. Mayhew

Traffic Injury Research
Foundation of Canada
Ottawa, Ontario

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The contents of this report reflect the views
and opinions of the authors, and not necessarily
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Ontario
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Transportation Regulation Development Branch
Safety Coordination and Development Office
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M3M 1J8

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A.C. Donelson and D.R. Mayhew

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The Traffic Injury Research Foundation of Canada
171 Nepean Street, Suite 600
Ottawa, Ontario
K2P 0B4

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Many agencies and individuals responded to our survey of driver-improvement practices. In many cases, very recent reports or pre-prints of papers were made available for our review. We acknowledge their assistance in Appendix B.

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EXECUTIVE SUMMARY

Sponsored by the Ontario Minister of Transportation and Communications (MTC), this report reviews present knowledge about driver improvement and describes the state of the art in this area of post-licensing control. Objectives of the study were as follows:

- to summarize and update findings of an earlier review of driver-improvement programs published by MTC in 1979;
- to identify and review literature on driver-improvement programs and other interventions not discussed in the prior review;
- to characterize "systems approaches" to driver improvement and to assess their effectiveness; and, to the extent possible,
- to compare the effectiveness of general approaches and specific programs.

Not included in this review are programs aimed at persons convicted of impaired-driving offenses; the predictive validity of demerit-point systems; and certain programs for "nonproblem drivers (for example, probationary or graduated licensing systems for novice drivers). The review and synthesis of information in the literature led to preparation of this report and to an extensive collection of other reports and papers relevant to driver improvement.

An Overview of Driver Improvement

Driver improvement as a traffic-safety measure had its inception in the mid-1930s. Evolution of the concept and practice of driver improvement has intimately involved driver-licensing agencies and computer-based technology. Three conditions, however, have hindered development of effective driver-improvement programs. First, as an issue in traffic safety, driver improvement has received neither sustained public attention nor high priority on political agenda. Second, because past approaches have depended largely on legislative initiatives, social

apathy and political inertia have retarded innovations in driver improvement. Third, partial responsibility for different aspects of driver improvement has resided with many agencies, none of which has had full authority to implement a comprehensive, coherent program to achieve maximal traffic-safety benefits.

Key issues for the future of driver improvement in traffic safety relate to (1) the philosophy of driver improvement; (2) the functional role of driver improvement; and (3) the capability of monitoring and evaluating driver-improvement programs.

The dominant philosophy of driver improvement has been punitive in nature, resting heavily on the legal concept of deterrence. Deterrent effects of punishment for traffic offences seem limited in preventing illegal and unsafe driving behaviour. Practical problems of traffic-law enforcement; the probabilistic nature of road accidents; and variability in driver performance contribute to the complexity, and tenuousness, of relationships among deterrent measures, driver behaviour, and traffic-crash rates. Although many driver-improvement programs are not punitive as such -- for example, educational courses and diagnostic clinics -- the driver-improvement process takes place in a context characterized by threats of sanctions, that is, licence suspension or revocation. "Warning letters" and probation hearings exemplify how fear of licensing actions has been used to "drive" driver-improvement systems.

For the most part, the functional role of driver improvement in traffic safety has been post-licencing control. Consistent with the overall aim of preventing road accidents, driver-improvement activities have included:

- identification of "problem" or "high-risk" drivers;
- treatment of identified "problem drivers"; and
- licencing actions.

Since the mid-1950s, both the concept and the practice of driver improvement have expanded, reflecting increased involvement of driver-

licensing agencies and the perceived need to maximize the impact of driver-improvement programs. Programs aimed only at "problem drivers" inherently have limited potential to produce traffic-safety benefits. Systematic approaches that would involve much greater numbers of "non-problem drivers" have been considered. A consensus has emerged: (1) continue the development, testing, and implementation of programs and licensing actions for identifiable problem drivers; and (2) integrate the driver-improvement function throughout the licensing system.

To these ends, evaluation and data systems for evaluation studies have played an essential part in the evolution of driver improvement. Principles of evaluation specific to administrative needs have been articulated and model systems for evaluation put in place, most notably in California. Very little progress is evident, however, in understanding how various driver-improvement programs produce results among those affected by them. The chronic failure to measure intermediate objectives that represent causal assumptions linking program activities to program outcomes is a significant barrier to progress. Identifying and measuring intermediate objectives (causal links) would enhance the "knowledge-generating" function of evaluation and increase the ability of administrators to formulate policy and manage programs in the area of driver improvement.

Specific Approaches to Driver Improvement

Programs and licensing actions in the area of driver improvement include warning and advisory letters; individual hearings; group meetings and educational courses; suspension, revocation, and probation; and various nonpunitive programs featuring rewards, incentives, and reinforcers.

Warning and advisory letters. Differences in findings from evaluation studies make it difficult to draw firm conclusions about warning/advisory letters as a driver-improvement tactic. For example, results of studies conducted in Oregon and California have strongly supported a warning-letter program but those in Washington and Virginia have not. Discrepancies in research findings might be attributable to differences

in warning letters -- content, level of personalization, degree of threat, format, and stage (violation level) of presentation -- or to inherent differences among driving populations in various jurisdictions. Such factors render direct comparisons difficult, if not impossible.

Moreover, even studies generally supportive of warning letters produce conflicting results. For example, in California, one study found that warning letters were most effective in reducing accidents whereas, more recently, another study found that warning letters significantly reduced convictions, but not accidents! Despite the equivocal nature of available evidence, most reviewers have recommended that warning letters be included in a driver-improvement system. It is generally thought that, though a warning/advisory letter may have little potential to reduce accidents, the letter remains cost-effective. Moreover, regardless of its effects, such a letter serves an important "notification function", for example, informing drivers of their current point status and possible departmental actions.

Individual hearings. Although individual hearings have taken various forms, hearings can be categorized as three types of face-to-face meetings: suspension, advisory, and clinical-diagnostic interviews. Early evaluation studies in California, Oregon, and New Jersey have indicated positive effects of individual hearings, particularly on subsequent collision involvement, regardless of the type of treatment. Some evidence suggests that the effectiveness of this form of driver-improvement action may be attributable to the fact of intervention per se (even just receiving a notice to attend) rather than to the hearing itself.

Most (but not all) recent evaluation studies generally confirm earlier findings, namely, that individual hearings can result in lower conviction rates. Importantly, several investigations in California found significant reductions in accidents subsequent to treatment. One study found that drivers most amenable to treatment were accident-involved drivers with a minimum of convictions. These results underscored the importance of considering drivers' records of accidents and convictions in matching problem drivers with different driver-improvement programs.

Group programs. Although group meetings vary from jurisdiction to jurisdiction, they can be classified as three general types: driver re-education, attitude change, and emotional/motivational. There are substantial differences in results of studies evaluating effects of group meetings. For example, the Defensive Driving Course has reduced violations, but not accidents. Other driver re-education courses have generally failed to improve driver performance and seem less effective than the DDC in reducing posttreatment violations. Group meetings that emphasize attitude change have been shown to have positive effects on subsequent violations and posttreatment accidents. Again, some evidence suggests that the type of treatment is less important than intervention per se. Notices to attend a treatment, however, often include a threat to suspend drivers' licenses upon further convictions. Separate influences of these factors -- treatment and/or threat of sanction -- cannot be determined, given the design of studies done to date.

Licensing actions. Licensing actions against traffic offenders are taken in every North American jurisdiction. The underlying rationale for punitive actions varies. Several jurisdictions impose sanctions primarily as a means to remove high-risk drivers and serious traffic offenders from the highways. In other jurisdictions, sanctions represent "teeth" of a driver-improvement process. The threat of licensing actions is believed to improve the overall effectiveness of lower-level, less punitive treatments. In most instances, actual restrictions or withdrawal of driving privileges are done only as a last resort.

The effectiveness of various licensing actions remain in question. For example, license suspension and revocation tend to improve the driving performance of drinking-driving offenders but not necessarily that of multiple traffic violators. Moreover, studies have consistently found that substantial numbers of drivers still operate motor vehicles after their licenses have been suspended. Evidence of the effects of probation is more consistent and generally positive. These findings support, to some extent, the notion that the threat of license suspension may deter many drivers from incurring further traffic violations and accidents.

Nonpunitive approaches. Psychological theories predict more lasting benefits from strategies and tactics employing rewards, incentives, and reinforcers than those resulting from punitive action. Applying theoretical principles in operational contexts like driver licensing and improvement has been difficult. First, no one theory or conceptual framework guides the practice of driver improvement. Second, there is persistent confusion over the meaning of such terms as negative reinforcement (which does not mean punishment). Third, psychological theories may provide plausible bases for the design and implementation of driver-improvement programs, but evaluation studies rarely gather data to test the validity of implicit assumptions.

As a consequence, the literature on rewards and incentives in driver improvement exhibits a loose mix of theory and post hoc speculation. Contradictory (and unexpected) findings of evaluation studies do not offer clear directions for the development of nonpunitive approaches to driver improvement. Nonetheless, the possibility that nonpunitive programs can improve driving performance among some subgroups of drivers remains.

Systematic Approaches to Driver Improvement

The idea that driver improvement is best considered as a "systems problem" is neither new nor untested. Systematic approaches to driver improvement has gradually replaced separate and uncoordinated programs administered by several agencies. This trend represents a concerted effort to rationalize driver-licensing and driver-improvement practices in the context of traffic safety. The contention is that, by systematizing otherwise related structures and activities, substantial progress toward reducing traffic-crash losses can be realized.

The rationale for developing systematic approaches depends on two premises. First, road accidents are not only driver failures but also system failures. Second, traditional approaches to driver licensing and driver improvement have not (and cannot) serve the aims of traffic safety in an optimal way. Current systems are not problem-solving in

nature; rather, emphasis is placed on the administration of penalties. Problem drivers are punished, but problems that drivers have go untreated.

In fairness to driver-licensing agencies, the above premises and criticism of existing systems presuppose conditions not satisfied in most jurisdictions. For example, traffic safety itself is not a fully coherent, coordinated enterprise. Public concern over traffic accidents (or traffic-crash risk) is not great -- except as it relates now to alcohol-impaired driving. Even today, many agencies and organizations have only partial mandates to carry out activities related to driver improvement. Nonetheless, evaluation studies have amply demonstrated (1) that systematic approaches can work more effectively than do programs carried out separately; and (2) that driver licensing and driver improvement as integrated functions have great potential to advance the cause of traffic safety.

Models of driver-improvement systems have been developed and actual systems have been implemented in many jurisdictions. In fact, recent developments have considerably blurred the distinction between driver licensing and driver improvement. In this context, a jurisdiction's overall philosophy and objectives in traffic safety determine its approach to -- and, ultimately, the effectiveness of -- driver-improvement programs implemented by driver-licensing agencies. Other essential components in advanced driver-improvement systems include planning, operations, and research/evaluation. Decisions made concerning the philosophy and objectives of driver-improvement systems will dictate the extent to which requirements for other components can be met. To maximize the effectiveness of a driver-improvement system requires careful coordination of all agencies involved in generating data on drivers and in delivering treatments.

A set of principles have been suggested for consideration in designing the operational component of driver-improvement systems. First, the severity of driver-improvement action should correspond to the seriousness of a driver's record. Second, a simple point system should form

the basis for identifying drivers for action. Third, once a driver enters the driver-improvement system, each additional conviction or accident should elicit a further response. Fourth, following any action, the driver should gradually exit from the system. Fifth, different categories of offenders (for example, youthful drivers, persons convicted of impaired driving, others) should not necessarily receive the same treatments.

Model driver-improvement systems have been based on "rational considerations and trends in empirical research". Experts have stressed, however, the requirement to replicate prior research and evaluation. Developing effective driver-improvement systems in different jurisdictions, with different driving populations, during different time periods is an interactive, evolutionary process, a process in which research and evaluation become indispensable. For example, only an integral research/evaluation component will allow administrators and staff to measure cost-effectiveness over time and allow rational system self-corrections. Each jurisdiction should consider the example of California's Department of Motor Vehicles, which has implemented a driver-improvement system representing the state of the art.

The idea of tailored treatments to address specific needs of drivers who evidence a higher risk of accident involvement represents the diagnostic-remedial function of driver-improvement systems. This strategy explicitly recognizes that different groups of drivers fall into the general category of "problem drivers" for many reasons, from lack of skills to poor attitudes, from chronic medical conditions to acute states like alcohol impairment. If high-risk drivers can be identified and their specific problem(s) diagnosed, then tailored-treatment approaches could be expected to increase both the cost-effectiveness and the efficiency of the driver-improvement process.

The identification of problem (or high-risk) drivers has largely depended on "demerit-point systems", in which various numbers of demerit points are assigned to traffic offenses and drivers are selected for corrective or punitive action based on point totals. The reliability

and validity of approaches based solely on demerit points as shown by driving records has been strongly questioned. In particular, research has demonstrated little need for complex point systems; instead, the simple sum of convictions for traffic offenses adequately serves the same purpose. Nevertheless, a driver's history of convictions does not necessarily predict subsequent accidents with acceptable accuracy.

Several studies have improved upon demerit-point systems by taking into account a number of other variables, including personal characteristics (e.g., age, sex, socio-economic status), type of vehicle, exposure to risk, and environmental characteristics (e.g., population density). Although methods to identify high-risk drivers remain imprecise, due in part to the probabilistic nature of road accidents, both demerit-point systems and related driver-record systems at least provide a starting point for identifying different groups of frequent offenders and accident repeaters. Continued research in this specialized area would assist in refining techniques needed to identify these groups of drivers for proactive, remedial treatment. In this context, cohort studies conducted in collaboration with licensing agencies represent a powerful tool to advance knowledge for practical applications.

However efficiently high-risk drivers are identified, it is unlikely that computer-based systems can diagnose specific problems in terms of driving histories. (Obvious exceptions to this generalization are persons with two or more convictions for alcohol-impaired driving offences; the greater the number of such convictions, the greater the likelihood that "problem drinking" or "alcohol dependence" explains poor driving performance.) The state of the art in problem-driver diagnostics, however, is not far advanced. An iterative approach to developing methods of assessment and referral seems required. For example, studies using best-available methods and diagnostic tools would be conducted to measure the differential responsiveness of drivers to treatments as a function of driver characteristics and other variables considered significant predictors of accident involvement. Based on findings of these studies, methods to increase both the selectivity of the referral process and the specificity of treatment programs could be developed.

If the most effective treatments for higher-risk drivers are also the most costly (an assumption that seems valid, but which should be tested), then tailored treatments offer great promise in streamlining and lowering the overall cost of driver-improvement systems -- not only in terms of programmatic costs, but also in terms of foregone crash losses.

Conclusions and Recommendations

The literature on driver improvement indicates two general directions for new initiatives: (1) agencies responsible for selecting clientele for driver-improvement programs should concentrate on intermediate processes needed to diagnose and refer drivers to specific programs for particular types of driving problems; and (2) the concept and practice of driver improvement should be broadened to include all stages of the licensing process (pre-licensing, at-licensing, post-licensing). To maximize potential gains for traffic safety, driver-improvement and driver-licensing functions should be amalgamated.

Decisions concerning the philosophy and objectives of driver-improvement efforts will determine the scope and traffic-safety potential of driver-improvement systems. Past experience and current practices provide an adequate basis for further developing driver-improvement systems. Whichever operational programs are selected for implementation, not only each program but also each system should be tested, evaluated, and monitored over time. Because each jurisdiction must adopt an "experimental posture", an evaluation/research component is an essential, integral part of any driver-improvement system. The purpose of this component is to assess the impact and cost-effectiveness of programs and to provide data needed to guide system self-correction and adaptation.

Imposing lists of outstanding requirements for research to advance the state of the art in driver improvement can be developed. Two general needs, however, can be identified. First, driver-improvement programs should deal as specifically as possible with actual driver problems that increase the risk of crash involvement. Moreover, to the extent possible, drivers having problems should be directed to participate in the

most appropriate programs. Not only the cost-effectiveness but also the cost-efficiency of driver-improvement programs can be increased. Second, because present knowledge offers little in the way of guidance, jurisdictions must take an iterative approach to maximizing the responsiveness of driver-improvement systems to drivers' needs. Based on evaluation research conducted as selected programs are implemented, subgroups of drivers who appear to benefit from programs will be identified as well subgroups who do not. If such findings are replicated, then only those drivers meeting criteria for subgroups that improve would participate in the programs. Treatments "tailored" to drivers' needs appear to be the next step in further advancing the state of the art in driver improvement. Valid procedures that diagnose problems drivers have; reliably select and refer drivers to specific treatments; and development of an array of programs responsive to drivers' needs can be future products of longer-range, systematic, iterative approaches to driver improvement.

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PREFACE

This report presents findings of a study designed to review present knowledge about driver improvement and to describe the state of the art in this area of post-licensing control. Objectives of the study, which was sponsored by the Ontario Ministry of Transportation and Communications (MTC), were as follows:

- to summarize and update findings of an earlier review of driver-improvement programs published by MTC in 1979;
- to identify and review literature on driver-improvement programs and other interventions not discussed in the prior review;
- to characterize "systems approaches" to driver improvement and to assess their effectiveness; and, to the extent possible,
- to compare the effectiveness of general approaches and specific programs.

Several topics relevant to driver improvement were excluded from the study by the sponsor: (1) programs and licensing actions aimed at persons convicted of impaired-driving offenses; (2) the reliability and validity of measures based on data from demerit-point systems and used to identify potential problem drivers for proactive treatment; and (3) driver-improvement programs developed for "nonproblem drivers". To varying degrees, however, we dealt with each of these topics when directly related to other topics within the scope of study (for example, programs in driver-improvement systems that target "nonproblem" drivers with the aim of preventing or delaying their entry into programs for "problem" drivers).

The project involved three main tasks: (1) the identification and collection of literature; (2) the review and synthesis of available information; and (3) the preparation of a report presenting findings of our review. Deliverable products of this work include not only the present report but also an extensive set of documents obtained during the period of study.

Basic to any comprehensive state-of-knowledge review is access to pertinent papers and reports and to agencies and individuals active in the field. Thus, the study required (1) an efficient process of document identification and acquisition and (2) extensive contact with North American agencies and experts responsible for driver-improvement programs and their evaluation. Direct contacts were established to identify (1) activities of interest not yet documented (program development, on-going evaluations); (2) recently initiated programs for which some documentation might exist but which had not yet been formally reported; and (3) recently completed evaluations for which pre-prints of reports or papers were available. Our approach to gathering up-to-date information, therefore, was twofold:

- a search of published literature contained in specialized libraries maintaining extensive and current holdings, supplemented by searches of data bases devoted to highway-safety literature; and
- requests for information directed to key agencies and associations in North America, supplemented by similar requests to institutes and other organizations abroad.

Our search for literature on driver improvement began in three libraries, those of MTC, the University of Michigan Transportation Research Institute (UMTRI), and TIRF. UMTRI's library provided both literature-search and document-acquisition services. Documents identified in this search provided references to others published previously. In addition, we explored several data bases, including the Transportation Research Information Services' TRIS-DIALOG file 63. Contacts with individuals and agencies known to be active in the area of driver improvement were established by telephone (for example, the California Department of Motor Vehicles). Jurisdictions that might be active were contacted by letter with the assistance of organizations and associations (for example, the National Association of Governors Highway Safety Representatives, the National Safety Council Traffic Records Committee, the Canadian Conference of Motor Transport Administrators). As primary sources of information were identified, we made follow-up

requests for documentation or more detailed information to supplement technical reports.

In reviewing the literature on driver improvement, we were impressed with the extent to which licensing agencies had relied on evaluation studies to test and improve programs over the past two decades. We were also impressed by the number and quality of papers that explored issues related to driver improvement. For example, researchers and administrators alike have grappled with questions concerning the philosophy and the role of driver improvement as it relates to traffic safety in general and to driver licensing and control in specific. Others have discussed the potential role of individual drivers in licensing and improvement as well as in the overall process of increasing traffic safety. The idea that drivers can participate as part of the system, rather than remain targets of punitive action by the system, has gained some ground. As driver-improvement programs proliferated over the years, many have asked whether it makes sense to conceive of a driver-improvement system, and, further, whether it makes better sense to think of driver improvement as one function of a larger system managing the education, qualification, advanced training, and control of the driving population. As a result, such concepts as probationary licensing; graduated licensing; two-stage driver education; and even a "master driver's license" for exemplary driving performance have been advanced. To varying degrees, these approaches have been developed and implemented.

Upon completing our review, we had gained a greater appreciation of opportunities available to licensing agencies in the area of driver improvement -- opportunities not only to consider different programs in place in other jurisdictions, but also alternative (and innovative) approaches to driver improvement as a functional subsystem in the larger highway-transportation system. To give the reader of this report a sense of the history and the possible future of driver improvement, we addressed both broader issues mentioned above and more specific questions about the range and effectiveness of different driver-improvement programs.

The organization of this report reflects our approach to summarizing the present state of knowledge in this area. Part One of the report provides an overview of driver improvement as a necessary component of traffic-safety initiatives. We discuss historical developments and still unresolved issues related to the "philosophy" of driver improvement; the role of driver improvement in traffic safety; and the requirement for evaluation in developing and evolving driver-improvement systems (or subsystems). Part Two, Specific Approaches to Driver Improvement, reviews what is known about the effectiveness of different programs for "problem drivers", including licensing actions. The possibility of nonpunitive approaches to driver improvement is also discussed in terms of theory and practice. Part Three, Systematic Approaches to Driver Improvement, discusses driver improvement as a "systems problem". By highlighting the rationale for systematic approaches to driver improvement and outlining several systems representative of the state of the art, we indicate the scope and complexity of actions required to develop and implement effective, integrated approaches to driver licensing and improvement. Not least among issues for future consideration is the feasibility of diagnosing and appropriately treating different groups of drivers with distinct problems. Part Four of the report presents our conclusions and recommendations for further work in the area of driver improvement.

Finally, in preparing this report, we endeavored to produce a comprehensive, well-documented review of the literature on driver improvement. We now know how difficult (and expensive) it is to track down and obtain needed reports and papers. For example, seminal reports, some published ten to twenty years ago, have ideas and offer insights still of great value today. But, readers wishing to refer directly to these papers must retrieve them from distant archives or order copies from depositories in the United States (for example, the National Technical Information Service in Springfield, Virginia).

In this report, we could have (more often than we did) abstracted key bits of information and referred interested readers elsewhere for detailed discussions of salient points. In keeping with our aim of

making available a "resource document" for driver-improvement initiatives in Canada, we instead chose to include extended quotations from original sources. If, like ourselves, readers prefer to have it "straight from the horse's mouth", with minimal paraphrasing and interpretation, then this approach may help avoid having to seek out other reports for basic, summary information on some topics.

For all readers, however, we should note that we provided an extensive set of documents obtained during this study to our sponsor -- Ontario's Ministry of Transportation and Communications. Moreover, TIRF's library has copies of documents referenced in the text of this report (see Section 9.0). Thus, as another product of this study, previous reports on driver improvement have become much more readily available in Canada than they were when we began our search for this literature.

PART ONE

AN OVERVIEW OF DRIVER IMPROVEMENT

1.0 DRIVER IMPROVEMENT AND TRAFFIC SAFETY

Beginning, perhaps, with a program for traffic offenders based in the Psychopathic Clinic of the Detroit Recorder's Court in 1936 (Heath 1962), driver improvement has evolved gradually over fifty years. A series of separate reviews has documented and discussed major developments (Kaestner 1968, 1972, 1974; Miller and Dimling 1969; Goldstein 1974; McGuire et al. 1976a,b; Marcus 1979; Li 1980). Each of the main features of driver improvement has taken shape over a period of ten to twenty years -- from incorporation of driver-improvement functions by motor-vehicle and driver-licensing agencies (American Association of Motor Vehicle Administrators 1956, 1965); to adoption of point systems for traffic offenses (Campbell 1958); to development of systematic approaches to driver improvement (McGuire et al. 1976a,b); to application of computer-based record-keeping technology (Tannahill and Tarrants 1982). The evolutionary process continues today, though at rates far slower than those evident between 1955 and 1980. Numerous factors seem to account for the methodical pace, including three prevailing conditions.

The issue of driver improvement has not received high priority or sustained public attention. Unlike some other traffic-safety issues -- impaired driving, occupant restraints, speed limits, vehicle standards (such as crashworthiness) -- "driver improvement" as such has not had a high profile socially or politically. Periodic waves of concern about impaired driving, for example, have driven efforts to deal with that problem. "We cannot hope to advance the cause of better driver licensing until the public realizes that effective driver control can do something for them, something that is constructive and definitely beneficial" (Kerrick 1974). Furthermore, in the U.S., reliance on a central funding body for research and program development (National Highway Traffic Safety Administration [NHTSA]) has left state agencies vulnerable to changes in Federal priorities. NHTSA fueled widespread activity in driver improvement during the 1970's, but largely turned its attention to alcohol-impaired and occupant-restraint issues beginning in 1980. With a few exceptions (notably California, Oregon, Pennsylvania),

most states entered a consolidation phase based on efforts in the previous decade. Jurisdictions dependent on developments in the U.S. -- for example Australia (Advisory Committee on Road User Performance and Traffic Codes 1980) -- may no longer find as broad an array of innovative, tested practices as before.

Related to the above, developments in driver improvement depend on legislative initiatives. "Driver licensing is a creature of statute and therefore legislative in inception" (Perini 1974). The history of driver improvement intertwines with that of driver licensing, traffic law, and traffic-offense adjudication. Whether driving is considered a right or a privilege, a driver-licensing agency operates within legislative and judicial constraints (Reese 1975). Moreover, social, political, and economic barriers to changes in the structure or administration of present driver-improvement systems can produce inertia, apathy, or frank resistance (Tofany 1975; Kaestner 1972), which influence legislative decision-making. Sensitivity among administrators to possible public outcry and adherence to processes dictated by existing legislation have interfered directly with the design and testing of driver-improvement programs (e.g., Lynn 1982a,b; McBride Planning 1981). Thus, improvement in systems responsible for the development and delivery of programs ultimately depends on public policy conducive to change. As expressions of policy, legislative initiatives will probably require greater awareness and support of the driving public than they have received to date. In the absence of a widely perceived need for change in driver-improvement systems, the ability of prime stakeholders -- motor vehicle and driver-licensing agencies -- to compete for priority on the legislative agenda seems less than desirable. One alternative is to invest greater legal authority and more discretionary power in the administrator of the licensing function (Perini 1974).

Responsibility for the driver-improvement function rests with multiple jurisdictions within countries and with multiple agencies within jurisdictions. Driver licensing and driver improvement are the responsibility of provincial agencies in Canada and state agencies in the U.S. Moreover, driver-improvement programs depend on many other agencies as

well -- from law-enforcement officials and the courts in the Traffic Law System (Joscelyn and Jones 1978) to private-sector deliverers of programs (McGuire et al. 1976a, p. 50; National Highway Traffic Safety Administration 1985, P. F11-15). Although driver-improvement systems have become a dominant theme in recent years (e.g., Weidman et al. 1982a,b; Li 1980), the approach in virtually all jurisdictions hardly seems systematic. The need for better communication, coordination, and cooperation has long been noted (Tannahill and Tarrants 1982; Kaestner 1972; McGuire et al. 1976a,b; Gilbert et al. 1980). The administrative complexity of driver improvement and the still-difficult dissemination of strategies and programs have retarded progress in this area. The published literature rarely satisfies requirements for knowledge or technology transfer (Marcus 1979, p. 15).

The above conditions relate to legal, social, political contexts in which administrators seek to "sell" the need for (and the effectiveness of) driver improvement strategies and programs. Other issues concern the development, demonstration or testing, and implementation of driver-improvement systems and their components. These issues are more germane to the present review because they pertain directly to the "philosophy" of driver improvement; its role in the larger, administrative system; the evaluation of programs in terms of loss reduction (safety enhancement); and the identification of target groups for intervention. The remainder of this section considers these issues, which remain as challenges for future initiatives in the area of driver improvement.

1.1 The "Philosophy" of Driver Improvement

If we define philosophy generally as "a theory underlying a sphere of activity or thought", then we must conclude that the dominant and pervasive philosophy of driver improvement is punitive in nature, resting heavily on the concept of deterrence. This traditional orientation has its historical roots in law-based approaches to traffic safety (Joscelyn and Jones 1972). Both criminal and administrative law became the foundation for societal efforts to control and modify driver behaviour and, by doing so, to reduce traffic crashes and associated losses.

If we accept that the ultimate goal of the traffic-safety enterprise is to reduce the frequency and severity of road accidents, then we must also recognize theoretical and practical limits of approaches based on threats and punishment. For example, Ross (1982) has documented temporary, marginal effects of deterring impaired driving, a specific form of illegal and unsafe driver behaviour. Less well researched are relationships between traffic-law enforcement or sanctions upon conviction and the prevalence of other "risky" driving behaviours. Nonetheless, concerns about the efficacy and legitimacy of deterrent-based approaches as means for ensuring safe (or improved) driver performance seem justified (see Pollack 1975, pp. 14-18). Based on their review of driver-licensing and driver-improvement practices, Miller and Dimling (1969) strongly criticized widespread reliance on deterrence for the control of driver behaviour:

> We must conclude, therefore, that the expenditure of considerable effort on the increase of enforcement activities cannot be expected, on the basis of presently available knowledge, to have a significant impact upon our primary objective of interest -- accident reduction. An alternative or at least a supplementary approach to the control of driver behaviour is urgently needed (VI-24).
>
> Over-reliance on the use of penalties alone cannot, however, be expected to produce long-term results. If our ultimate general objective is to <u>improve</u> driver behaviour, to raise the average quality of driving performance, probably the most we can expect from the use of penalties is to temporarily suppress the frequency of performance of undesirable acts while we apply other techniques to educate, retrain, or re-motivate (VI-25).

Consistent with the broader literature on punishment and its behavioural effects (Solomon 1964), studies examining the deterrent effects of sanctions for traffic offenses have produced discouraging results. The oft-cited study by Coppin and Van Oldenbeek (1965) found that one-third of drivers with suspended licenses and two-thirds of drivers with revoked licenses had records of convictions or accidents during periods when these "ultimate" licensing sanctions were in force. In Israel, Shoham (1974) evaluated the deterrent effect of punishment in terms of subsequent traffic offenses. Based on stepwise multiple-regression

analyses, he found (1) no relationship between the severity of punishment and the seriousness of later offenses; and (2) the more severe the punishment for a first offense, the higher the rate of recidivism. Homel (1980, 1981) also reported a positive correlation between severity of penalty and likelihood of recidivism for certain subgroups of persons convicted of impaired driving.

Why general-deterrent measures and punishment for traffic offenses appear to have low potential for preventing (1) illegal and unsafe driver behaviour or (2) road accidents attributable to driver performance has been more the subject of speculation than the object of empirical test. A combination of diverse factors would appear to mitigate the effects of threats and penalties as illustrated in the following excerpts, taken from three separate reports.

> Currently the sanctions applicable to traffic violations emphasize a punitive approach. Typically the errant driver receives a fine, or in more serious cases loses his operator's license or receives a jail sentence. Inherent in such an approach is the notion that the violation is the result of deliberate risk-taking, or, at the least, avoidable carelessness, for which punishment will serve as a deterrent to repetitions. This characterization of the traffic offender tends to ignore the complex nature of the psychomotor process called driving. Additionally, there is evidence that the punitive approach may not be effective with a small, though highly visible proportion of drivers. This same segment of society continues to account for a highly disproportionate amount of activity on the part of enforcement and licensing agencies, despite repeated contacts with law enforcement officials and the courts. (Ames and Micas 1972, p. 1)

> The mental element of intention (mens rea) which exists in criminal law does not exist with regard to traffic offenders. The obvious intention of the driver is to get from place to place and not to break traffic laws. In most traffic offences it is possible to discover an element of negligence which is characterized by lack of care or by failure to anticipate events. Punishment, therefore, can have no possible effect on the lack of intention to commit an offense, while it may lead to the taking of excessive care, which is not always desirable when driving.
>
> The fact that there is a positive correlation between more severe punishments for the first offense and the

commission of a greater number of offenses, leads to the assumption that personal elements are the principal causes leading to the commission of an offense. These personal elements may well be the factors defining the capabilities of the driver.

Lack of driving capability also explains the lack of dependence between the severity of punishment and the gravity of additional offenses, as well as the fact that more severe punishment is correlated with recidivism. The result of severe punishment on a driver lacking basic driving capabilities may cause him excessive anxiety. This anxiety will not prevent his using the vehicle, but will further decrease his self-confidence, and will arouse hesitation on the one hand, and tension on the other, creating an atmosphere inducive to the commitment of a violation.

The findings of the above analysis suggest that offending drivers are made up, in fact, of two groups: (1) recidivist drivers whose lack of basic driving capability is apparently due to personality factors, and (2) "normal" drivers whose commission of traffic offenses is apparently caused by a temporary lack of driving ability due to unclear situations or to chance. (Shoham 1974, pp. 68-69)

In the case of driver behaviour, penalizing drivers for the commission of violations may not even lead to a reduction in the frequency of commission of violations, but instead to a reduction in the probability of their future apprehension; instead of the penalties operating to improve the driver's skill at performing the driving task and obeying traffic laws it may operate to improve his skill at watching for patrol cars and avoiding future detection. Thus, the net effect of the penalty is not to decrease the probability of violation, but rather the probability of apprehension. Further, the over-use of penalties to decrease the frequency of an undesired act may, for certain types of individuals and under certain conditions, actually lead to an <u>increase</u> in the frequency of that act. For example, the fining of certain types of habitual offenders may serve to increase the satisfaction such individuals receive from "getting away with it" in the future.

One interesting phenomenon frequently observed by those who regularly dispense penalties for undesirable acts appears to be a form of displacement. What seems to occur is that the penalty received by an individual as a consequence of performing an undesirable act does not serve to reduce the individual's motivation to perform the act, but instead serves to increase the individual's anger and hostility toward the dispenser of the penalty. Thus, no matter how polite, courteous, or apologetic a patrol officer may be as he writes out a ticket, no matter how well he explains the necessity of enforcing

> traffic laws in the interests of highway safety, the individual receiving the ticket may develop an actual hatred of patrol officers, or at least an abiding dislike or mistrust. (Miller and Dimling 1969, VI-25,26)

Alternative explanations are also possible. For example, given the low rate of detection of traffic offenses by police, drivers may well perceive that the benefits of illegal behaviour outweigh the low-probability costs of arrest and punishment. Moreover, "there is obviously a substantial amount of luck or chance in determining accident involvement because of a complex chain of interactive events that determine a given accident occurrence" (Peck and Kuan 1983, p. 372). The practical problems of traffic-law enforcement; the stochastic (or probabilistic) nature of road accidents; the vagaries of driving performance; and the variability of personal and social characteristics among drivers illustrate (if not define) the complex and tenuous relationships among deterrent measures, driver behaviour, and accident reduction.

It may seem ironic that the "philosophy" of many early driver-improvement programs contrasted greatly with the legalistic context in which they arose. The design and content of these efforts reflected the influence of psychologists (driver-improvement clinics) and educators (traffic schools). The clinics emphasized a medical or curative model, as the terms diagnosis, remedial treatment, rehabilitation, and treatment indicate. This approach featured psychiatric assessment, psychophysical tests, and psychometric evaluation of driver attitudes (Miller and Dimling 1969, p. IV-11). The traffic schools were often court-sponsored and "theoretically educative rather than punitive (although coercion is generally implicit)" (Miller and Dimling 1969, p. IV-12). Their emphasis involved re-education, re-training, and correction of "bad-driving" habits of traffic violators and drivers with suspended licenses.

By the mid-1950s, two trends seem evident, both reflecting efforts to educate or rehabilitate drivers prior to licensing sanctions. First, driver-improvement clinics operated by licensing authorities became eclectic. For example, "these clinics typically require attendance at

four two-hour sessions over a four-week interval and usually involve traffic safety lectures, movies and slides, psychophysical testing and terminal quizzes of knowledge and attitudes about driving" (Miller and Dimling 1969, p. IV-19). Second, other programs with well-defined conceptual frameworks emerged. For example, driver education courses were structured on models of the driving task (McGuire et al. 1976a,b); group-meeting approaches applied principles of "group dynamics" and "behaviour modification" (Ames and Micas 1972, pp. 31-45).

The mix of punitive, therapeutic, preventive, and educational philosophies was reflected in a statement of rationale for driver improvement:

> The ultimate objective of Driver Improvement is to assure the safety of the licensee and of other persons using the highways. To achieve this purpose the program must attain these specific objectives:
>
> 1. To improve the attitudes and driving performances of drivers who, because of traffic violations and/or accident involvement, are known to constitute a hazard on the highways; and to instill in those drivers the will to better their driving practices.
>
> 2. To determine whether problem drivers suffer from physical and mental deficiencies, and the ways they affect the safe operation of motor vehicles.
>
> 3. To apply appropriate restrictions, or to use the device of "deferred action," when drivers suffer from physical or mental conditions that do not appear to preclude safe driving.
>
> 4. To eliminate from the highways the unsafe, incompetent, and physically or mentally unqualified driver by refusing to licence him or by withdrawing his driving privilege. (American Association of Motor Vehicle Administrators 1965)

Kaestner (1972), Goldstein (1963, 1975), Miller and Dimling (1969), Myrick and Schlesinger (1964), and others strongly criticized traditional approaches to driver licensing and driver improvement, attacking the validity of explicit (and implicit) assumptions linking program activities to intended outcomes. Recommended alternatives to present policies

and practices included comprehensive human-factors and systems approaches.

Nonetheless, the generally punitive atmosphere in which "driver improvement" takes place prevails, exemplified by most forms of "warning letters" and probation hearings. Universal (and expensive) reliance on license suspension or revocation remains a key element in the driver improvement process. Two of the general recommendations put forward by Staplin and Knoebel (1985, p. 30) represent the predominant way of thinking in the area of driver improvement:

> A consistent theme to emerge in the evaluation of different program activities is that it is the fear of license suspension or revocation that "drives" the driver improvement apparatus, and the perceived lessening or removal of this threat will undermine the effectiveness of any treatment [Lynn 1982]; it is therefore recommended that the option of punitive sanctions not only be retained but, if anything, be made more salient to negligent drivers, especially those convicted of alcohol-related offenses. (An exception can be justified for "pre-negligent" or "entry level" traffic violators, for whom a "soft sell" approach may be more effective.)
>
> It has been shown that incentive programs which award safe driving "credits" or delete violation "points" following designated periods of accident- or conviction-free performance do not improve driving behavior, and often cause distortion and reduce the diagnostic capability of point systems in identifying drivers who need treatment [Lynn 1982]; it is recommended that this practice either be excluded, or otherwise restricted from influencing the accuracy of the diagnostic instrument, in a revised driver improvement program.

We have two objections to these recommendations. First, the authors represent as tested conclusions that may be described kindly as working hypotheses. For example, Lynn (1982b) speculated (her word) that certain disappointing results of an evaluation of Virgina's driver improvement program stemmed from perceptions among participants concerning the "leniency" of the process compared to the "old sanctions". Second, the case for or against incentive-based programs in general, including the specific approach mentioned, is far from decided (McBride and Peck 1970; Harano and Hubert 1974; see also Section 6.0 of present

report). The reference to Lynn (1982b) may be appropriate with respect to concern about the diagnostic value of driver records and point counts, but not to the effectiveness of incentive programs, for which Lynn (1982b) offered opinions based neither on her evaluation findings nor on a careful review of the literature. It would seem that the "diagnostic capability" of driver-record systems could be preserved by modifications in software; issues related to the effectiveness of incentive programs can only be resolved through sound research.

1.2 The Role of Driver Improvement in Traffic Safety

Traditionally, the concept and practice of driver improvement have complemented those of driver education and driver licensing (Kaestner 1972; Miller and Dimling 1969). In general, driver-education courses represent a pre-licensing stage, which stresses acquisition of basic knowledge and skills. Driver licensing itself is a process of qualification, with tests of vision, knowledge of the rules of the road, and ability to operate motor vehicles. The raison d'etre of driver improvement, therefore, has been post-licensing control.

Targets for so-called remedial action -- reminder or "warning" letters, rehabilitation, re-education, -- are those drivers with numbers of convictions or traffic accidents that indicate a threat to safety. According to Peck (1976, p. 493),

> The scope and complexity of these programs vary from state to state, but virtually all distinguish three driver sub-groups: (1) habitual "minor" traffic offenders and/or accident repeaters, (2) serious major offenders (drunk driving, hit and run, etc.) and (3) physically and/or mentally impaired drivers.
>
> The greatest variability in program formulation among the states resides in the first category, and this is also the area where the greatest amount of research and program evaluation has been conducted. The range of state programs for habitual traffic offenders varies from simple mandatory "point" systems which automatically trigger license suspensions to more complex sequential driver improvement programs which attempt to elicit record improvement and attitude change prior to the point

of taking punitive or restrictive action against the driver's license privilege.

Consistent with the overall aim of preventing traffic accidents, driver improvement includes three general functions:

1. Identification of "problem" or "high-risk" drivers, usually based on records of convictions and accidents.

2. Treatment of identified "problem drivers", sometimes including pre-treatment diagnosis and usually involving a multi-stage array of programs.

3. Licensing actions, from restrictions on driving (where and when) to outright revocation of licenses (removal of the driving privilege).

Whether viewed as punitive or rehabilitative (Ames and Micas 1972), driver-improvement efforts have largely served a reactive or "after-the-fact" role in dealing with problem drivers. Since the mid-1950s, however, the scope of driver improvement has expanded both in concept and in practice. This trend, which continues, results from the combined influence of two distinct factors: (1) the increasingly dominant role of driver-licensing agencies in the area of driver improvement; and (2) the need to maximize the impact of driver-improvement programs.

With respect to the first factor, agencies responsible for motor vehicle and driver licensing have gradually incorporated all driver-improvement functions into their administrative domain (AAMVA 1965; Miller and Dimling 1969). The centralization and automation of driver-record systems gave to driver-licensing agencies the most efficient means of identifying habitual offenders or accident repeaters. Moreover, the relative ineffectiveness of license suspension or revocation became obvious over time (Gilbert et al. 1980, pp. 44-46). As McGuire and Peck (1977a) observed, these "ultimate" sanctions rely on the cooperation of problem drivers. Official loss of the driving privilege does not usually curtail the personal freedom to drive. Enforcement of these measures was (and is) problematic. The ability to identify "problem drivers" and the inability to deal with them effectively exposed a gap

in the "licensing system" -- namely, the lack of programs to address "root causes" of poor or dangerous driving performance. Given social, political, and practical constraints, driver licensing per se could not efficiently perform a "screening function", preventing the initial licensing of high-risk groups (Goldstein 1963; Miller and Dimling 1969; Waller 1974). The diagnostic and remedial actions so clearly needed were, perforce, post-licensing functions and, therefore, most closely related to existing driver-improvement efforts. Development and expansion of driver-improvement programs thus took place within the licensing system.

The second factor contributing to broadened concepts of driver improvement was the demonstration of theoretical and practical limits to the accident-reduction potential of traditional driver-improvement programs. The early work of Forbes (1939) and more recent investigations (e.g., Campbell 1975; Coppin 1975; Goldstein 1975; Harano et al. 1975; Peck et al. 1971; Stewart and Campbell 1972) completely discredited the notion that a small group of "accident-prone" or "high-risk" drivers will account for a large proportion of traffic crashes. Nonetheless,

> the idea that a relatively small number of accident repeaters account for a large part of the problem is entrenched in the highway safety lore. It is entrenched partly because of its philosophical and political appeal. It is attractive to assert that a large part of the accident problem is attributable to a small proportion of drivers, especially if they can be labeled as undisciplined, aggressive or deviant. Society can harshly restrict such a group of drivers, but not in the larger "normal" group. After all, the normal group is "us" whereas the small deviant group is "them." Thus, there is a degree of appeal in the idea that the accident repeater causes a large part of the problem because it seems more feasible to regulate such a relatively small group of drivers. Indeed, sometimes support for this notion of the accident repeater takes the form of statements such as:
>
> 2% of drivers account for 50% of fatal accidents, or
> 10% of drivers account for 40% of all accidents, or
> 7% of drivers account for 100% of all accidents.
>
> This sounds promising because the first number is so small relative to the second. The implication is that we

> can identify the two percent, and then potentially prevent 50 percent of future accidents. (Campbell 1975, p. 40)

As Campbell went on to discuss, the problem with this representation is twofold. First, the statistics pertain to past events and not to the future. The belief that the same individuals will account for a large percentage of accidents in subsequent years is simply unfounded. Second, the statistics based on percentages imply that a "small" group of drivers has a relatively "large" number of accidents. The implication is appealing -- and misleading!

> This appeal is diminished when the percentages are converted to frequencies. Now the statement [2% of drivers cause 50% of fatal crashes] reads, "2,000,000 drivers cause 29,000 fatal crashes". Thus, two percent of 100 million U.S. drivers is two million, and 50 percent of 57,000 fatalities is about 29,000. This statement shows that from a large number of drivers (2,000,000) comes a much smaller number of crashes (29,000). This is exactly the opposite of what the percentage figures are intended to convey. While it may seem promising to deal with two percent of drivers to get at 50 percent of fatal accidents, it is more formidable to have to regulate 2,000,000 drivers to get at 29,000 fatal accidents. (Campbell 1975, p. 41)

Using California data, Coppin (1975, p. 48) illustrated the potential for preventing future traffic accidents by removing drivers with previous accidents from the road.

> About 1.5 percent of the drivers are involved in two or more accidents in a two-year period. If these drivers were removed from the road, 3.3 percent of all accidents in a subsequent year would be prevented. Again, notice the two-fold risk of this group. Similarly, 9.5 percent of the drivers had one accident in a two-year period and their contribution to the next year's accidents will be 16.7 percent. It follows, then, that once having removed all persons with some form of prior accident record (even one accident), there remains 80 percent of all of next year's accidents coming from the 89 percent of all drivers who for the past two years have been accident free.

The limited effectiveness of programs and measures aimed at problem drivers stem from the "low stability and sensitivity of recorded accidents" (Peck 1976, p. 499), which in turn reflects (1) the complex etiology of road accidents and (2) the tenuous relationship between driving behaviour and accident involvement. Peck (1976) summarized the dilemma for the area of driver improvement based on "a conceptual analysis of the driving task and the factors which influence driving behavior and criterion performance". His discussion warrants an extended quote.

> Analysis ... leads to the following conclusions:
>
> (1) Driving behavior is a complex function of many variables.
>
> (2) Accidents are not a direct behavioral measure but a stochastic consequence of many interactive events, including the behavior of other drivers.
>
> (3) Although unsafe driving behaviors are undoubtedly frequent events, accident occurrences are relatively rare events. Thus, the probability of a given unsafe behavior resulting in an accident is very low.
>
> (4) Safe driving behavior can be involved in accidents due to the unsafe behavior of others or when drive task demands and external contingencies exceed normal operator capabilities.
>
> The preceding postulates have direct implications for driver modification and set rather severe limits on the amount of change that can be expected from any intervention program. There are several reasons for this deduction. First, even if a program were 100% effective in changing negligent driver behavior from unsafe to safe, the effects on recorded accidents frequency would not be extremely large because of the limited control that drivers have over accident involvement. Driving behavior and accident frequency are not highly correlated. Second, and perhaps most important, risk taking and negligent driving is [sic] often reinforced by non-occurrence of accidents and citations and may result in various socio-psychological rewards (e.g., peer approval, freedom, getting places faster, not getting caught, masculine self-image, release of tension, etc). In the parlance of behavior modification, the amount of differential positive and negative reinforcement contingent upon safe and unsafe driving behavior is very

> low. Any positive changes in attitude toward risk and driving knowledge following treatment will often extinguish because the driver will soon find that risky acts rarely result in accidents.
>
> The problem of effecting accident reduction through driver-oriented improvement programs stems from the same issues which limit our ability to construct selection instruments and equations that accurately discriminate between accident-free and accident-involved drivers. Using the Newbold-Cobb formula (Cobb, 1940) for computing the maximum attainable correlation between an accident criterion and infallible (no measurement error) set of predictors, [Peck, McBride, and Coppin 1971] reported that validity coefficients in excess of .39 were not possible on the three-year accident frequencies of the general California driving population. In predicting the accident frequencies of a large normative sample of California drivers, Burg (1975) obtained the following multiple correlations:
>
> (1) Three-year concurrent accident criterion, .329.
> (2) Three-year non-concurrent accident criterion, .234.
> (3) Six-year concurrent accident criterion, .403.
>
> These coefficients are among the highest ever reported on a representative sample of United States drivers, illustrating the practical limits of accident prediction. (pp. 497,499)

The findings of research quoted above shattered the "silver bullet" myth -- the possibility of solving a large proportion of the accident problem by focusing on a small number of accident-prone drivers -- and helped shift attention to alternative approaches to driver improvement (McGuire et al. 1976a, pp. 26-27).

Myrick and Schlesinger (1964) had previously advocated a systems approach to traffic safety in general and to driver improvement in specific. They contended "that driver improvement can best be accomplished by improving the methods of management of those organizations responsible for traffic safety" (p. 92). In their view, violators, departments of motor vehicles, police, highway engineers, and others concerned with traffic safety <u>all</u> comprise a system. Rather than consider "problem drivers" as completely wrong and the licensing agency as completely right, they recommended a perspective that treated traffic

violators and accidents as potential signs of malfunction in the system at large. Through better communication and coordination among various parts of the system, and by stressing a problem-solving approach in contrast to the fixing of blame, system improvement would yield greater gains. Of interest, their recommendations along with practical illustrations also hint at a community-based, grass-roots approach to highway safety.

Miller and Dimling (1969) stressed the importance of diagnosis of problems related to driver control and improvement, based on a comprehensive, empirically tested model of the driving task. They concluded that using driver licensing as a "screening out" process for the general population was unrealistic. That idea was based on industrial and military models where tasks were very well defined, the selection criteria rational and stringent, and training (and re-training) a feature of those systems. The alternative involved the concept of driver licensing as a diagnostic-remedial process, objectives of which were to "educate and improve applicants during the licensing process" and to diagnose weakness and provide assistance, counsel, or information as needed" (pp. VI-42,43). Development of driver-licensing systems with these attributes would require (1) tested models of the driving task; (2) tested models that empirically predict probability of accident involvement based on group characteristics; and (3) appropriate diagnostic and remedial procedures based on driver-task analyses.

Kaestner (1974) expanded on themes discussed by Myrick and Schlesinger (1964) and Miller and Dimling (1969). Kaestner sketched the potential of driver improvement in terms of a systems approach in which "problem analysis" takes into account "at least three levels in the hierarchy of systems in which the driver interacts": (1) the cultural system, an industrialized, mobile society in which economic, social, and legal forces act on the driver; (2) the transportation system, including the highway environment, traffic law enforcement, and licensing agencies; and (3) the microsystem of driver-vehicle-environment. Kaestner contends that "the effectiveness of various driver rehabilitative devices is a product of how well these measures relate to the needs of the

higher order system and subsystem" and that "progress in driver improvement may well depend on the ability to recognize the driver's problem in these larger contexts" (p. 363). Like Miller and Dimling (1969), Kaestner points to the need to extend the concept of "problem driver" to include all drivers; to define more usefully both the driving task and standards of acceptable driving performance; and to refine criteria of "problem driving". Similar to Myrick and Schlesinger (1964), Kaestner identifies "improvables" in the larger systems that relate to drivers and driving. Here, the diagnostic value of accident reporting and the specificity of treatment offered in driver improvement programs require attention. Kaestner concluded that the distinction between driver licensing and driver improvement was artificial. The prevailing notion that the role of driver improvement was to "exert punitive pressures on a small minority of recalcitrant drivers" (p. 377) hindered progress. Rather, driver improvement should begin as people become eligible to drive. Again, the aim is to establish a diagnostic-remedial process in which drivers participate throughout their driving career. Along with this shift in thinking about driver licensing and improvement, a comprehensive model of the driver's task would provide the foundation for pre-licensing training, qualification for licensing, and post-licensing reexamination, diagnosis, and remedial treatment. Table 1 summarizes Kaestner's analyses of "ideal programs" compared to "present programs".

Perhaps reflecting a more pragmatic, operational viewpoint, Peck (1973, cited in McGuire et al. 1976a, p. 27) recommended another approach to driver improvement, given that the accident-reduction potential of programs were limited by five factors:

1. The size of the population directly affected by the program.
2. The relative accident risk index of the target population.
3. The modification potential of the target population.
4. The modification power of the treatment.
5. The indirect or deterrent effect of the program on other drivers.

TABLE 1

Comparing Present to Ideal Driver Improvement Programs

Program Features	Present Program	Ideal Programs
Orientation	Coercive-punitive	Instructional-motivational
Purpose	Improve (attitudes toward) driving	Reduce personal injury and property damage
Target population	Hard-core "intractable" cases	All eligible drivers
Initiation stage	Excessive convictions and/or collisions	Pre-licensing training
Relation to other licensing functions	Little or none	Diagnostic-remedial initial licensing; routine retesting and retraining
Relation to prior driving records	Basis for suspension and revocation	Violations as critical incidents or near accidents, individualized rehabilitation

from Kaestner (1974), p. 376.

Peck recommended focusing on factor number (1) as the best and easiest way of increasing program impact. This can be done by "lowering the point count level for negligent driver improvement contact and considering average and superior drivers as candidates for positive and preventive types of driver improvement." (McGuire et al. 1976a, p. 27)

The ideas and ideals expressed in the literature on the role of driver improvement have become thematic in the past decade. The distinction between driver licensing and driver improvement has blurred considerably in practice. Models of driver-improvement systems, both conceptual and actual, suggest preventive strategies -- approaches to delay drivers' entry into rehabilitative and punitive treatment stages -- as well as traditional tactics (McGuire et al. 1976a,b; Li 1980; Weidman et al.

1982a,b). Because the concept of driver improvement has come to include the average driver along with problem drivers, the opportunity to incorporate rewards and incentives in driver improvement systems has greatly increased (Pollack 1975, pp. 9-11). A principal force in the U.S., the National Highway Traffic Safety Administration (NHTSA) sponsored programs of research and development along lines recommended by experts in the field. For example, Eberhard (1974) outlined NHTSA's ambitious program plan designed "to improve driver performance by upgrading driver preparation, initial driver licensing, driver reexamination, problem driver rehabilitation, and license restriction".

> A tailored treatment approach to education, training, and control will be used as the basis for developing programs in these areas. With this approach, the individual is first screened to determine whether training or regulatory action is needed. Emphasis in the research program is, for passenger car operation, on finding ways to make it possible for greater numbers to drive safely; it should not be limited to removing greater numbers of drivers. Therefore, there is a need to provide those responsible for training and examining drivers with the most efficient and effective techniques for guaranteeing that all road users possess the minimum capabilities for safe operation in the highway system. Thus, there is need to develop (a) safety-oriented curriculum for driver preparation, (b) safe driver performance standards against which applicant capability can be compared, and (c) driver improvement techniques for those whose capability is below standard. Furthermore, based on evidence that drivers whose licenses are suspended or revoked continue to drive, more effective enforcement of license restrictions needs to be developed and implemented. (Eberhard 1974, pp. 22-23)

Through direct grants to state agencies and continued support of program development in the area of driver licensing and improvement, NHTSA has continued to foster the evolution of driver licensing systems and their three major components: driver screening and license issuance; driver improvement; and system support (Tannahill and Tarrants 1982). For example, California's "Post Licensing Control Reporting and Evaluation System" -- a remarkable tool for research, evaluation, and program development -- was funded by NHTSA (Peck 1976). The model driver-improvement system developed by McKnight and associates (Weidman et al. 1982a,b) represents another product of NHTSA's program. The integration

of provisional licensing concepts, including graduated licensing (Waller 1974; Mayhew and Simpson 1984), with driver improvement programs for youthful, newly licensed drivers provides just one more of many pieces of evidence that progress in driver improvement continues (NHTSA 1980a; McKnight et al. 1983).

In summary, both the actual and perceived role of driver improvement has changed gradually since the inception of programs for "problem drivers" during the mid-1930s. The concept of driver improvement as a reactive component in efforts to enhance traffic safety has slowly given way to proactive, preventive perspectives. Two factors appear to have engendered and sustained this trend: (1) the leadership role of motor-vehicle and driver-licensing agencies, which incorporated driver-improvement functions in their administrative systems; and (2) the appreciation that traffic-safety goals were best served by broadening both the concept and the operational domain of driver-improvement policies and programs. Driver-licensing agencies provided a systems context for the expansion and evolution of driver improvement. "Systems thinking" along with statistical research destroyed the belief that substantial reductions in traffic accidents could be achieved by punitive or rehabilitative measures aimed at persons labelled as "problem drivers". A consensus reflected throughout recent literature has thus emerged: (1) continue the development, testing, and implementation of programs and licensing actions for identifiable problem drivers; and (2) integrate the driver-improvement function throughout the licensing system, including all licensed drivers. Progress along these lines seems very much in evidence.

1.3 Evaluation and Driver Improvement

Ideally, evaluation serves as a tool of management by determining how and to what extent a program achieves its intended results. The theoretical value and practical utility of evaluation remains largely unappreciated in many fields, particularly traffic safety. The area of driver improvement seems exceptional, not because the need for adequate,

scientific evaluation studies has been recognized -- this is common -- but because exemplary evaluation systems have been created and used well.

Early evaluation studies in the area of driver improvement suffered from deficiencies in design (Miller and Dimling 1969): (1) failure to use appropriate control groups to take into account "regression-to-the-mean" phenomena; (2) use of such intermediate criteria as attitude changes to measure the effectiveness of programs; and (3) use of conviction frequencies as a surrogate measure of accident-reduction effects. By the mid-1970s, Peck (1976, pp. 499-501) could offer a definite set of design principles to enable "program development [to] evolve in a coherent fashion and allow us to say with assurance that a given program does or does not reduce accidents, by how much and under what conditions":

1. Random assignment to treatments and use of control groups is essential.

2. Extremely large Ns are required for adequate statistical power.

3. Cost benefit analyses, or other utility decision models, should be incorporated into program evaluation research designs.

4. Driver improvement program evaluation should be relevant to the operating environment in which the program and decision makers operate.

5. Research should be done and replicated on a programmatic basis.

An evaluation system based on these principles -- the California Post Licensing Control Reporting and Evaluation System, Department of Motor Vehicles -- has proven its worth, supporting a rapid, efficient evolution of cost-beneficial programs for "negligent operators" (Peck 1976; see also Helander 1984 and references).

Evaluation as an integral component of driver-improvement systems provides continuous opportunity for experimentation and system self-correction; thus, "optimal use may be made of limited funds through the

elimination of ineffective programs and introduction of innovative cost-effective ones" (McGuire et al. 1976a, p. 47).

Specific issues related to evaluating the effectiveness of driver-improvement programs have been reviewed extensively in the literature (e.g., Peck 1976; Marcus 1979). A general issue, however, seems to have received little attention: given adequate definition of a client population, and given reliable and valid measures of ultimate outcomes (e.g., decreased rates or numbers of accidents), how do various treatments produce measured results among those receiving them? To date, published evaluation studies have contributed relatively little to advancing knowledge about why some programs in certain jurisdictions are effective and similar programs in other jurisdictions are not. As Kaestner (1974) discussed, the impact of many driver-improvement efforts may be examples of the "Hawthorne effect", where changes occur not because of the design or content of interventions but simply because an intervention took place. The chronic failure to measure intermediate objectives that represent causal assumptions linking program activities to program outcomes is a significant factor in this regard.

For example, Helander (1984) reported a study designed to evaluate current and alternative strategies for selecting and treating accident-involved drivers in California. Analyses of the interaction between treatments and subject selection criteria revealed that accident-involved drivers with minimum conviction histories were amenable to treatment intervention, while accident-involved drivers with more extensive conviction histories were not. The remarkable impact of the treatments -- accident means reduced by an unprecedented 20% compared to control groups -- could not be explained!

> The role of specific content of the treatments in achieving accident reduction is unclear from the results of this study. The reexamination and accident avoidance session treatments produced statistically equivalent results on standard criteria drivers, despite their divergent approaches. (The reexamination is essentially diagnostic in nature, while the accident-avoidance

> session was oriented toward behavior modification.) It seems reasonable to infer from this evidence that the content of the intervention is perhaps not as important as the intervention per se. The roles of personal contact and/or license suspension in mediating treatment effects are also unclear given the significant impact of the pamphlet/self-test treatment, which involved no personal contact or license suspension, on the "minimum conviction" subgroup. It thus appears, as implied by Goldstein (1973), that drivers selected on the basis of accidents are simply more amenable to treatment than drivers selected on the basis of convictions. (Helander 1984, p. 38)

The findings reported by Helander (1984) have obvious and profound implications for selecting both drivers for treatments and programs for implementation. The study also illustrates the potential (but unrealized) value of making explicit the presumed causal relationship between program activities and clearly articulated goals and objectives. In this regard, the literature on driver improvement shows a pronounced lack of program models, the purpose of which is to define analytical frameworks and to specify measurable activities and outcomes conceptually linked by one or more testable hypotheses (Wholey 1977; Nap et al. 1976). The identification and measurement of intermediate objectives (causal links) increases the "knowledge-generating" function of evaluation and the opportunity to provide timely feedback to management and program staff.

1.4 Summary

Driver improvement as a traffic-safety measure had its inception in the mid-1930s. Evolution of the concept and practice of driver improvement has intimately involved driver-licensing agencies and computer-based technology. Three conditions, however, have hindered development of effective driver-improvement programs. First, as an issue in traffic safety, driver improvement has received neither sustained public attention nor high priority on the political agenda. Second, because past approaches have depended largely on legislative initiatives, social apathy and political inertia have retarded innovations in driver improvement. Third, partial responsibility for different aspects of

driver improvement has resided with many agencies, none of which has had full authority to implement a comprehensive, coherent program to achieve maximal traffic-safety benefits.

Key issues for the future of driver improvement in traffic safety relate to (1) the philosophy of driver improvement; (2) the functional role of driver improvement; and (3) the capability of monitoring and evaluating driver-improvement programs.

The dominant philosophy of driver improvement has been punitive in nature, resting heavily on the legal concept of deterrence. Deterrent effects of punishment for traffic offences seem limited in preventing illegal and unsafe driving behaviour. Practical problems of traffic-law enforcement; the probabilistic nature of road accidents; and variability in driver performance contribute to the complexity, and tenuousness, of relationships among deterrent measures, driver behaviour, and traffic-crash rates. Although many driver-improvement programs are not punitive as such -- for example, educational courses and diagnostic clinics -- the driver-improvement process takes place in a context characterized by threats of sanctions, that is, licence suspension or revocation. "Warning letters" and probation hearings exemplify how fear of licensing actions has been used to "drive" driver-improvement systems.

For the most part, the functional role of driver improvement in traffic safety has been post-licencing control. Consistent with the overall aim of preventing road accidents, driver-improvement activities have included:

- identification of "problem" or "high-risk" drivers;
- treatment of identified "problem drivers"; and
- licencing actions.

Since the mid-1950s, both the concept and the practice of driver improvement have expanded, reflecting increased involvement of driver-licensing agencies and the perceived need to maximize the impact of driver-improvement programs. Programs aimed only at "problem drivers"

inherently have limited potential to produce traffic-safety benefits. Systematic approaches that would involve much greater numbers of "non-problem drivers" have been considered. A consensus has emerged: (1) continue the development, testing, and implementation of programs and licensing actions for identifiable problem drivers; and (2) integrate the driver-improvement function throughout the licensing system.

To these ends, evaluation and data systems for evaluation studies have played an essential part in the evolution of driver improvement. Principles of evaluation specific to administrative needs have been articulated and model systems for evaluation put in place, most notably in California. Very little progress is evident, however, in understanding how various driver-improvement programs produce results among those affected by them. The chronic failure to measure intermediate objectives that represent causal assumptions linking program activities to program outcomes is a significant barrier to progress. Identifying and measuring intermediate objectives (causal links) would enhance the "knowledge-generating" function of evaluation and increase the ability of administrators to formulate policy and manage programs in the area of driver improvement.

PART TWO

SPECIFIC APPROACHES TO DRIVER IMPROVEMENT: PROGRAMS AND LICENSING ACTIONS

INTRODUCTION TO PART TWO

The following sections review present knowledge about the effectiveness of specific driver-improvement programs.

Section 2.0 deals with warning and advisory letters, the least intrusive of official interactions with drivers who come to the attention of licensing authorities.

Section 3.0 discusses individual hearings, of which there are several kinds: advisory, clinical-diagnostic, and suspension.

Section 4.0 reviews programs that involve groups of drivers. Driver re-education courses comprise one category of such programs. Other categories of group programs include attitude-change and emotional/motivational approaches.

Section 5.0 discusses the effectiveness of various licensing actions, including suspension, revocation, and probation.

Section 6.0 examines nonpunitive approaches to driver improvement, especially the use of rewards, incentives, and reinforcers to increase the likelihood of safe-driving behaviour among problem drivers.

2.0 WARNING AND ADVISORY LETTERS

A written communication -- a "warning" or "advisory" letter -- is usually the first of a series of official interactions with "problem drivers". A driver may receive a letter following one or more driver-record entries. According to Kaestner et al. (1967), the letter serves two primary functions:

> o to notify drivers that their records have come to the attention of the Department because of the frequency of traffic difficulties in the last year or so; and
>
> o to encourage drivers to improve their driving behaviour or face the possibility of other direct action by the Department of Motor Vehicles regarding driving privileges. (p. 67)

It is generally thought that the notification function alone provides adequate justification for inclusion of such communications in the driver-improvement process (Kaestner et al. 1967; McGuire et al. 1976a; Marcus 1979; Li 1980). For example:

> The significance of the warning letter as a device to indicate to the driver with excessive number of entries on his record that his driving performance is under study and will continue to be so is of unquestioned value to a driver improvement program. Therefore, it is assumed that the first function of the driver improvement letter is an essential one and, by itself, justifies the continued use of this device in over-all driver improvement operations. (Kaestner et al. 1967, p. 67)

Moreover, Kadell and Peck (1979) have shown that, even though accident-reduction benefits of a warning/advisory letter are small, the letter is still cost-effective. They estimated that, if this treatment were eliminated, reducible program costs for warning/advisory letters would have been less than $1 per driver compared to $15 per driver for group meetings and $55 per driver for individual hearings.

Notwithstanding favourable judgments, several studies have evaluated the effectiveness of warning/advisory letters in reducing the frequency of

accidents and convictions of problem drivers. Early evaluation studies by Temple and Ferguson (1958) in Texas, Campbell (1958) in North Carolina, and King (1960) in Michigan did not find consistently positive effects of the standard form letter on subsequent driver behaviours. For example, Temple and Ferguson (1958) found no significant differences 24 months subsequent to treatment in accidents and convictions between 200 drivers who had received warning letters and a control group of 200 drivers. In contrast, Campbell (1958) and King (1960) report a positive effect of warning letters in reducing post-treatment convictions and a combination of convictions and accidents. These early studies, however, had serious methodological flaws (i.e., small sample size, pre-treatment differences in comparison groups, inappropriate control groups: see McGuire et al. 1976a), which make interpretation of their results extremely difficult.

In reviewing early evaluation studies, Goldstein (1973) concluded that, if well constructed, the warning letter could be an effective deterrent. He concluded, however, that existing forms of warning letters could be much improved. Consistent with this view, the primary intent of several evaluation studies conducted in Oregon and California has been to vary the content and format of the letter, particularly with respect to the dimension of "threat and intimacy". Such studies have shown positive effects of certain types of warning letters on driver performance. Based on reviews of these studies, several researchers have described "optimal" letters:

- a "soft-sell tailored letter" for any entry against a drivers record, followed by a standard warning letter after 9 points or the equivalent (McGuire et al. 1976a, p. 51).

- For the letters to achieve their purpose, that is, provide warning to drivers, letters must be sent to drivers at an early stage, preferably after the driver's first infraction. The tone of the letters should be non-threatening, but personalizing (using personal pronouns) the letter is not yet warranted. The content of the letters should stress the consequences (such as endangering self and others, financial loss and personal inconvenience) of negligent driving and drivers' responsibility for

improving their driving. There is also a possibility for incorporating some safety information into the letters, tailoring the information to specific needs of the violators. The use of warning letters need not be limited to the first offenders but could be used in combination with other types of programs (Li 1980, p. 45).

- o They should be reasonably brief, readable at the 6th to 8th grade level, and be slightly threatening. Information to be contained in these letters should include: costs associated with the continued convictions, i.e., fines, increased insurance premiums, lost time; increased risk of suspension; summary of previous convictions (McBride Planning 1981, p. 5).

In their description of a driver-improvement system for traffic violators, Weidman et al. (1982a) also include a warning letter as the first driver-improvement contact following two conviction points. Based on their review of the literature, they concluded that, for optimal effectiveness, the warning letter should be "brief, readable, intimate, non-threatening, and informative".

Brevity -- Since violators cannot be required to read the letter, they must be encouraged to do so. One way of encouraging violators to read the letter is to keep it to an "approachable" length, i.e., no more than one page.

Readability -- The letter should be written in language that can be readily understood by the general population (i.e., 5th-6th grade reading level). This also will encourage violators to read the letter in its entirety and will help them understand the information presented in the letter.

Intimacy -- A driver improvement letter needs to look "official" so that it won't be discarded as "junk" mail, but need not appear unduly formidable. A study by Kaestner, Warmoth and Syring (1967) found that personalized letters were significantly more effective in reducing subsequent violations and accidents among drivers aged 25 and under. Consequently, it would seem desirable to address the driver by name rather than by license number and to maintain a tone of personal interest throughout.

Level of Threat -- McBride and Peck (1970) found low-threat warning letters to be more effective at reducing subsequent accidents and convictions among violators.

> Consequently, the tone should be constructive, conveying the idea that the letter is being written to help the driver avoid unpleasant consequences.
>
> Information -- The letter should inform drivers that their record is worse than most driver's and indicates a tendency to drive unsafely. This information in itself may lead drivers to reassess and improve their motoring habits. The letter also should describe the offenses on record by type, location and date. In addition to "personalizing" the letter, such information lets drivers know what is on their records (many don't know), gives violators a chance to clarify any misunderstanding or mistakes pertaining to their records, and forestalls objections to participating in system instructional activities (should this be required later). (Weidman et al. 1982b, pp. 14-15)

They also recommend issuing a second warning letter for those individuals convicted of a violation more than 12 but less than 24 months after the first warning letter is sent.

Thus, based largely on supportive evidence from two jurisdictions -- Oregon and California -- many researchers have expressed views in favour of warning letters. Nevertheless, some disagreement remains over such questions as the degree of intimacy; the level of threat; and the conviction level at which the letter(s) should be issued. Studies conducted in Washington (O'Neall 1975) and more recently in Virginia (Lynn 1981, 1982a,b) have cast doubt on the effectiveness of warning letters in reducing either accidents or violations. Basically, both studies report that such letters had no effect on posttreatment driving records. Lynn (1982b) even recommended that the "entry-level treatment program" be modified to eliminate warning letters.

Given these disparate results, the effectiveness of warning/advisory letters in improving driver performance has yet to be firmly established. We expand on this point in the following sections, which offer a more detailed review of studies in four jurisdictions that have examined effects of warning/advisory letters.

2.1 Oregon

In Oregon, Kaestner et al. (1967) investigated the effects of varying the form and content of warning letters on drivers' subsequent accidents and convictions. The authors randomly assigned 944 male drivers eligible for the standard warning letter into one of four groups: the no-letter control group (241); the standard-form-letter group (240); the personalized standard-letter group (231); and the personalized soft-sell-letter group (232). Pre-treatment driver records for the four groups were similar with respect to prior convictions and accidents. The investigators compared the proportion of successes (no driver record entry; minor violations or nonchargeable accidents only) and failures (serious moving violations or chargeable accidents) in each treatment group to the control group for six- and twelve-month post-treatment periods. The results for the six-month post-treatment comparisons showed that the standard letter was not significantly better than no letter at all. But, both the personalized standard-letter group and the personalized soft-sell letter group had significantly fewer failures than the no-letter group and the standard-letter group. The failure percentage for both violations and avoidable accidents declined systematically from the control group to the standard-form-letter group, to the personalized-letter group, and finally, to the personalized soft-sell letter group. Although the soft-sell format had a higher success rate, the rate did not differ significantly from that of the other personalized letter. Kaestner et al. (1967) concluded, however, that "only by combining the personalized effect and the change of content (soft-sell format) is it possible to significantly increase the percent of successes over a six month interval".

Kaestner et al. (1967) also compared the driving records of the three warning-letter groups and the no-letter control group twelve months after treatment. Similar results were obtained, but only the personalized, soft-sell letter had a significantly better success rate after twelve months. More detailed analysis focussing on driver age indicated that the two personalized letters significantly improved success rates for male drivers under 25 compared to no-letter controls, but they had

no significant effect on male drivers over 25 years of age. Thus, the effectiveness of the two personalized letters was primarily due to the improvement of male drivers under 25. Of note is the fact that male drivers under 25 have the highest rates of accident involvement.

Kaestner and Speight (1975) evaluated the effects of license suspension compared to other treatments. They randomly assigned 960 drivers to five groups: no contact; a "last-chance" warning letter; a probationary license; a Defensive Driving Course; and license suspension. As described by Kaestner and Speight (1975), the "last chance" group received letters informing them that they were eligible for suspension, but due to possible hardships and inconvenience, they would be given one last chance to improve their driving record. "Successes" were defined as violation-free drivers with no chargeable accidents one year subsequent to treatment. In this study, the "last chance" warning letter was <u>not</u> effective in reducing the number of drivers with moving violations or chargeable accidents. Moreover, the letter did not have a significant delaying effect on the time between the date of treatment and the date of the first failure. They concluded that "a 'last-chance' warning letter is no more effective than the traditional discretionary suspension employed in the Oregon driver improvement program" (p. 65).

Li (1980), however, reviewed another study by Kaestner and Hawes (1977) that suggests an opposite effect. According to Li (1980), Kaestner and Hawes (1977) found that sending a "last chance" warning letter to drivers who are one infraction short of revocation procedures was associated with a significant delaying effect. Based on these findings, Li (1980) concluded that "warning letters may be effective regardless of the driver's level of infraction. Letters sent to either first or chronic offenders were effective in delaying or deterring them from subsequent infractions" (p. 46). As noted previously, however, the Kaestner and Speight study (1975) indicates that this pattern may not hold for those individuals facing suspension (only temporary loss of license).

In sum, the Oregon studies suggest that an initial personalized letter had a positive effect on first-time offenders. Moreover, a "last

chance" warning letter was effective with chronic offenders facing revocation but not with those facing suspension.

2.2 California

Similar to Kaestner et al. (1967), McBride and Peck (1970) investigated the effect of varying the degree of threat and intimacy of a warning/advisory letter on subsequent accidents and violations among recipients. The investigation involved randomly assigning 18,000 drivers eligible to receive a departmental warning letter to no-letter control and the following five letter-treatment groups -- high threat/high intimacy (HT/HI); high threat/low intimacy (HT/LI); low threat/high intimacy (LT/HI); low threat/low intimacy (LT/LI); and standard (STD). The investigators examined subsequent accidents and countable traffic violations of drivers in the various groups during the first seven months. With respect to post-treatment total accidents, McBride and Peck (1970) report that only the low-threat letter groups had significantly fewer accidents than the control group. While the standard-letter group also had fewer accidents than controls, the results were not significant. Focusing on violations, they report that none of the treatment letters produced results significantly different than no letter at all.

In reanalyzing the data using less stringent statistical tests, however, McBride and Peck (1970) report that all letter groups were directionally better than controls on accidents as well as on violations. They conclude that this analysis provides "strong support for an overall letter effect on accidents" and is "at least suggestive of a treatment effect" on violations. As noted by the authors, the greater impact of the warning letters on accidents than on convictions was unexpected. They speculate that this result may be due to the fact that "the effective warning letters actually altered the underlying driving attitudes or habits of certain recipients. Instead of merely obeying laws, some drivers were possibly motivated to drive more defensively" (p. 173).

McBride and Peck (1970) also examined differential effects of warning letters by age, sex, and marital status on subsequent post-treatment accidents. They found that:

- the standard letter appeared most effective for single males under the age of 30 and 31-40 as well as the oldest age groups;
- the low threat letter appeared the more effective treatment for married drivers, particularly those under 30; and
- the low threat letter appeared the most effective for females with the possible exception for single females over the age of 30.

Based on these results, they conclude that the low-threat letter should be used for female drivers and married males under 30 and that the standard letter should be used for all other drivers. This contrasts, to some extent, with a conclusion from the study by Kaestner et al. (1967), namely, that a personalized letter appeared most effective in improving the driver records of young males.

Also in contrast to Kaestner et al.'s (1967) findings, McBride and Peck (1970) reported that a personalized approach was not effective for changing driver behaviour. They found that low-threat letters and the standard (moderate threat) letter were most effective for accident reduction. The authors speculate that discrepancies between Oregon and California findings could be attributed to "some differences in the letter content" or to differences in administrative procedures, geography, and population.

McBride and Peck (1970) examined the effect of a reinforcement letter that acknowledged improvement of warning-letter subjects who remained accident- or violation-free seven months following initial treatment. An examination of the five-month driving record subsequent to reinforcement revealed that for drivers who initially received a letter low in threat and high in intimacy, the follow-up reinforcement letter had a positive effect on accidents but not on violations. The standard letter was also shown to reduce collisions under no reinforcement.

A follow-up investigation in California produced results that are not entirely consistent with those reported by McBride and Peck (1970). Epperson and Harano (1974) randomly assigned 16,513 drivers eligible for the warning-letter program to two letter-treatment groups -- a low threat/high intimacy (LT/HI) warning-letter group and a standard warning-letter group. The letters were basically the same as those employed by McBride and Peck (1970). (Since no control group was used, results relate only to the effectiveness of one treatment relative to the other, and no conclusions can be drawn about a specific treatment's overall effectiveness on driving performance.) The mean number of collisions and convictions did not differ significantly between subjects who received the LT/HI warning letter and the standard letter. Similar results had been reported by McBride and Peck (1970).

Differences, however, emerged between the two studies with respect to reinforcement effects. In contrast to the earlier study, the LT/HI warning letter did not result in significantly fewer collisions with reinforcement nor did the standard letter reduce collisions with no reinforcement. With respect to convictions, Epperson and Harano (1974) found that the LT/HI warning letter group following reinforcement had significantly fewer convictions than the standard warning letter group, whereas McBride and Peck (1970) did not. A further difference in results of the two studies emerged in analysis of treatment effects by age, sex, and marital status. In contrast to the earlier findings, Epperson and Harano (1974) found no significant letter treatment effects.

An additional factor evaluated by Epperson and Harano (1974) was the effect of an informational pamphlet enclosed with the warning letter. As described by the authors, "the pamphlet was designed to provide the subject with basic information regarding negligent driving and critical self-analysis". Drivers receiving the pamphlet had significantly fewer collisions (but not fewer violations) than those who did not receive the pamphlet. The positive effect on collisions, however, occurred only for the first six months after treatment. In fact, an examination of the second six-month period suggested that the pamphlet appeared to have a

negative effect on collisions. The investigators speculate that this time reversal may be an artifact of data (chance occurrence) or may indicate that the pamphlet has only a shortterm effect.

Based on their findings, Epperson and Harano (1974) recommended no change in California's low-threat warning-letter program. They also observed that their analyses provided little support for tailoring warning letters for different sub-populations or for the adoption of a reinforcement-letter program.

In an investigation of the first three years (1975-1978) of California Department's negligent-operator program, Peck and Kadell (1983) compared the proportion of drivers who were accident-and conviction-free in warning-letter groups with that of a control group. The results indicated that the warning letter significantly reduced traffic convictions but not traffic accidents. The investigation revealed that warning letters reduced conviction frequencies by about 4%. Although the warning letter prevented only an estimated 1.2 accidents per 1000 drivers treated, cost-benefit analysis showed that the warning letter was cost-beneficial.

In 1981, California's negligent-operator program was modified to include a low-threat general warning letter at a lower point count than previously administered and a second, more severe warning letter that threatens license suspension for further point counts (California Department of Motor Vehicles 1985). An examination of the driving records of treatment and control drivers during the first six months of 1985 revealed that the initial warning letter and the subsequent notice of intent to suspend reduced the number of drivers cited for traffic violation after treatment by 10.2 and 9.9%, respectively (Marsh and Kadell 1985). Due to small sample sizes and short follow-up period, no data were provided on any effects of these treatments on accidents.

2.3 Washington

O'Neall (1975) evaluated the effectiveness of two letter-contact programs, comparing letter recipients to a non-contact driver group in the

State of Washington. Subjects -- 600 drivers eligible for a group-interview treatment -- were randomly assigned to one of three groups -- (1) a non-treatment group; (2) a first-class letter group who were mailed a letter informing the subject of a) the Department's awareness of the driver's recent poor driving performance, b) the Department's placement of the driver under a six-month surveillance, and c) the Department's intention to take further action if the driver receives additional citations during the surveillance period; and (3) a certified-mail letter group who received the same letter by certified mail. According to O'Neall (1975), the intent of the certification process was to:

> o increase the probability that the letter would be delivered to and received by the driver or someone in the addressee's immediate household;
>
> o increase the probability that the driver would identify the communique as being something other than "junk mail" and would open and read it;
>
> o convey the impression that the Department considers the matter to be of significant, personal importance;
>
> o increase the probability of awareness by others in the household of the driver's problem and possibly induce them to apply coersive familial pressure for the recipient to respond with affirmative action. (p. 5)

Pre-treatment analysis for assignment biases revealed that the two letter treatment groups and the control group were comparable with respect to sex, age, prior citations, and accidents. Post-treatment analysis of group differences revealed that the two letter groups citation and accident failures (proportion of drivers who accumulated record entries following treatment) were not statistically different from controls for one, three, six and twelve months following treatment. Moreover, O'Neall (1975) reports that the two letters did not significantly delay the length of time between treatment and the receipt of the first post-treatment citation or the first post-treatment accident relative to the control group.

One criticism of this study is that small sample sizes may have prevented detection of small differences in measurement criteria -- accidents and violations -- between treatment and control groups. Peck and McBride (1970), Marsh (1978), Marcus (1979), and Lynn (1982b) (among others) have discussed issues related to precision and sample size. Since each of the comparison groups included fewer than 200 subjects, the lack of statistical difference between groups may have resulted more from the design of the study than from the actual "ineffectiveness" of warning letters.

2.4 Virginia

As part of a comprehensive evaluation of Virginia's driver-improvement program, Lynn (1981, 1982a,b) reported on the effectiveness of an advisory letter in reducing post-treatment accidents and convictions. Traffic violators eligible for receipt of an advisory letter were randomly assigned to letter treatment (4,899) and no-contact control (4,884) groups. As described by Lynn (1982b), "the letter informs the driver that he has accumulated sufficient points to warrant the Division's concern and warns him that if he accumulates additional points, he may become eligible for additional administrative action, possibly including suspension of his driver's license" (p. 3). Lynn (1982b) found no significant differences in mandatory convictions, major convictions, minor convictions, delay in subsequent offenses, or accidents in any of the three-month post-treatment periods as well as for the 24-month post-treatment period as a whole. An examination of survival curves (number of persons remaining conviction free at various 5-day time periods) for advisory letter and control groups did reveal that, for the first 3 months, the advisory-letter group lost fewer subjects to new convictions than controls and the treatment group was reduced by a smaller amount than controls in each 5-day period. These slight differences, however, disappeared over subsequent study months.

Lynn (1982b) also found that the advisory letter, when combined with the "very effective group interview" (effective in reducing convictions, not accidents), produced no significant effect on accidents or convictions.

She concluded that "the advisory letter-group interview treatment combination was no more effective in reducing subsequent accidents and convictions than its corresponding no-treatment condition or than the advisory letter only" (p. 27). These results differ markedly from those reported by Marsh (1978) in California, who found that prior warning letters improved the effectiveness of some group-meeting treatments.

Lynn (1982b) offered the following observations to explain the negative interaction between advisory-letter and group-interview conditions:

> There may be something about the content or the format of the letter that reduces its credibility with program participants. The timing of the letter, coming only after the expenditure of the driver's safe-driving points, may also reduce its impact. However, neither of these hypotheses explains why receipt of the advisory letter subverts the impact of the group interview. A more likely explanation, one that is consistent with the rest of the study findings, relates to the individual offender's perception of the system. As hypothesized in previous reports, an offender receiving an advisory letter requiring no action on his part may come to the realization that the current system[1] is nowhere near as strict in terms of license suspension as the older system of sanctions. Persons receiving a subsequent group interview can then conclude that since they have had two separate occasions to participate in the driver improvement program and still retain their licenses, the program again is more lenient in terms of suspension. This would be especially true if the persons had expended their 5 safe-driving points (a driver must accumulate a total of 6 demerit points in a 1-year period before receiving the advisory letter) in advance of being contacted. They may have accrued as many as four convictions for a total of 11 or 12 points prior to even receiving an advisory letter (Virginia also awards safe-driving points to accident- and conviction-free drivers so that drivers would have to expend these points before treatment). If it is assumed that the fear of suspension is the underlying power that drives the driver improvement apparatus,

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[1] In 1975, Virginia modified their strictly punitive traffic offenders system (license suspension and revocation) to a program of driver improvement that included an advisory letter, group or personal interviews, driver improvement clinics, periods of probation and, as a last resort, license suspension and revocation.

> the removal of this treatment may undermine the entire system. On the other hand, the individual receiving a group interview after two convictions (more serious convictions and higher demerit points resulting in assignment directly to group interview, thus bypassing the advisory letter) view the sacrifice of an evening of his time, and the subsequent emotional trauma of attending the meeting, as somewhat comparable to the older sanction of suspension - different but similar in severity. This could account for the effectiveness of one treatment and the ineffectiveness of the other. This is also consistent with other study findings, in that the further the offender has advanced in the system and the closer he is to license suspension, the more likely the treatment is to be effective (p. 39)

Based on these findings, Lynn (1982b), recommended that Virginia's driver-improvement procedures be altered to eliminate the advisory letter, or alternatively, to use the letter (1) to warn a driver that all safe-driving points have been used or (2) to congratulate a driver for obtaining new safe-driving points. Of interest, however, Lynn (1982b) also recommended termination of the awarding of safe-driving points to both accident- and conviction-free; in Lynn's view, bonus points allow drivers to accumulate more convictions than those drivers without bonus points before remedial action is taken. According to Lynn (1982b), "these incentive point programs do not improve driving behaviour and often cause distortion and reduce the diagnostic capability of the point system in identifying drivers who need treatment" (p. 42). We are unaware, however, of any evidence for Lynn's assertion that Virginia's incentive-point program does not improve driving.

2.5 Summary and Discussion

Evaluation studies in Oregon and California provide supportive evidence for advisory/warning letters. Their results, however, were not entirely consistent. For example, Kaestner et al. (1967) found that the "soft-sell personalized" letter was effective in reducing violations and avoidable accidents. Because all recipients were male, possible effects of personalizing a letter for female violators remained intermediate. They also showed that a "last chance" warning letter is an effective

treatment in delaying a "first failure" for drivers near license revocation (longterm or permanent loss of license) but not suspension (shortterm, temporary loss of license) (Kaestner and Hawes 1977; Kaestner and Speight 1975).

Several studies conducted in California also demonstrated that warning/advisory letters can be an effective treatment. McBride and Peck (1970) found strong support for an overall letter effect on accidents and some support for a treatment effect on violations. In contrast to findings reported by Kaestner et al. (1967), however, McBride and Peck (1970) reported that a personalized approach was not effective for changing driver behaviour; rather, low-threat letters and the standard (moderate threat) letter were the most effective letters for accident reduction. A more recent investigation by Peck and Kadell (1983) indicated that the warning letter significantly reduced traffic convictions but not accidents. Marsh and Kadell (1985) also report that a warning letter triggered by fewer point counts and a subsequent, more severe warning letter have a positive impact in the number of traffic citations. No information was included in the latter report concerning treatment effects on subsequent accidents. From a cost-benefit perspective, the warning letter appeared to be cost-beneficial even given negligible or small accident-reduction benefits. (Kadell and Peck 1979; Peck and Kadell 1983; Marsh and Kadell 1985).

Evaluation studies in Washington and Virginia do not provide supportive evidence for warning/advisory letters. O'Neall (1975) reported that warning letters did not have significant effects in either reducing numbers of accidents or violations or in increasing the time between treatment and subsequent failure. This study, however, probably included too few drivers to detect violation- and accident-reduction effects.

The evaluation study by Lynn (1981, 1982a,b) in Virginia provided a stronger test of advisory-letter effects. Lynn (1982b) found that a warning letter had no effect on subsequent driving records and that the letter, when combined with an effective group meeting, appear to negate positive group-meeting effects.

Differences in findings from evaluation studies reviewed in this section make it difficult to draw firm conclusions about warning/advisory letters as a driver-improvement tactic. For example, results of studies conducted in Oregon and California have strongly supported a warning-letter program but those in Washington and Virginia have not. Discrepancies in research findings might be attributable to differences in warning letters -- content, level of personalization, degree of threat, format, and stage (violation level) of presentation -- or to inherent differences among driving populations in various jurisdictions. Such factors render direct comparisons difficult, if not impossible.

Moreover, even studies generally supportive of warning letters produce conflicting results. For example, in California, Peck and McBride (1970) found that warning letters were most effective in reducing accidents whereas, more recently, Peck and Kadell (1983) report warning letters significantly reduce convictions, but not accidents! Despite the equivocal nature of available evidence, most reviewers have recommended that warning letters be included in a driver-improvement system. It is generally thought that, though a warning/advisory letter may have little potential to reduce accidents, the letter remains cost-effective. Moreover, regardless of its effects, such a letter does serves an important "notification function". For example, although Lynn (1982b) found that a warning letter had no effect, she conceded that the letter may be useful for informing drivers of their current point status and possible departmental actions.

3.0 INDIVIDUAL HEARINGS

The individual hearing is a method often employed to initiate face-to-face contact as well as at later stages in the overall process to improve the performance of "problem" drivers. Marcus (1979, pp. 20-22), in a review of early studies on individual hearings, identified three types of face-to-face interventions:

- the suspension hearing in which the driver examiner decides whether to suspend the problem driver's license, place him/her on probation or simply to warn him/her that he/she risks such action being taken if he/she continues to accumulate demerit points;
- the advisory hearing consisting of a brief driver improvement interview, to persuade the problem driver to make an effort to improve his/her driving record; and
- the clinical-diagnostic interview involving clinical analysis in which the problem driver is examined medically, psychologically, and in terms of his/her driving knowledge and skills.

Of the three approaches, the clinical-diagnostic interview represents the most intensive, time-consuming and costly driver-improvement intervention. This approach, which dates back to 1936 and the Psychopathic Clinic of the Recorder's Court in Detroit, attempts to determine "why certain drivers have accidents, why some of them get arrested and what part the driver's defects played in the serious traffic situation "(Heath 1962, p. 10). During these early years, there was a growing recognition that "it was not elements such as the condition of the road or the condition of the vehicle that made the major contribution to traffic accidents but rather it was the drivers' psychological reactions which made for desirable or undesirable driving performance" (Heath 1962, p. 10). The main objective of the clinical approach was therefore:

> to examine the whole individual, and from an examination of the whole to arrive at a knowledge of the significance of the various aspects of his personality - the relative

> importance of each sector of his personality in a given situation. The application of the clinical approach in the analysis of accident causes involves a complete study of the individual involved in accidents - it makes the individual the point of departure, and provides for a thorough examination of every factor - physical, mental, social, and economic, and of those extraneous to the individual - which may have played a part in the accident in which he has been involved. (Heath 1962, p. 1)

The advisory hearing represents an abbreviated, less time-consuming, and thereby, less costly version of the clinical hearing. Similar to the clinical approach, the principal purpose is a detailed examination of the driver's record to determine why the problems have occurred; to discuss how such problems differ from normative driving behaviour, and to provide necessary remedial counselling. By means of educational and motivational techniques, attempts are made to persuade the driver to improve future driving performance.

The principal aim of the suspension hearing, however, differs from that of the clinical and advisory hearing in that it is designed not to persuade the driver, but rather to take licensing action. For example, Marcus (1979, p. 20) described an interview used by the State of Michigan:

> the driver record and attitude of the driver are analyzed and one of the following forms of action or disposition is taken: (1) a verbal warning as to future departmental action if the driving practices of the driver do not improve; (2) a restriction of the extent of the driving privilege; (3) a temporary discretional period of suspension of the driver's license; (4) a revocation of the driver's license for one year; (5) the interviewer and driver may agree to a safe driving (probation) period without suspension as long as the terms of the agreement are observed by the driver (Chalfant 1960).

Early evaluation studies have found that these three types of interventions have been successful in reducing convictions and, in some cases, accidents (Marcus 1979; Goldstein 1963; McGuire et al. 1976a; Kaestner 1968). Kaestner (1968) reviewed evaluation studies of individual hearings in California, Oregon, and New Jersey. A brief description of

each of these treatments is provided below, followed by a discussion of their traffic-safety impact.

3.1 Early Studies of the Effects of Individual Hearings

Coppin et al. (1965) evaluated the California hearing, which was (at that time) a suspension-type approach in which the driver examiner focussed on drivers' records. They described the hearing as:

> a 30-40 minute contact between the subject and a departmental driver improvement analyst, during which the subject's record is discussed, and various suggestions for improvement in record are made by the analyst. Consistent with the legalistic, social-control orientation of the program, the hearing process is not therapeutically structured, and, as a consequence, the driver improvement analyst (i.e. hearing referee) does not follow or receive training in contemporary counselling techniques. The analyst's basic role is to impress upon the subject the importance of safe driving habits and of the ramifications of continued traffic law violations and accidents. At the end of the hearing, the analyst informs the subject that a final decision as to the department's course of action will be made by headquarters, and the subject is then dismissed. His case is later reviewed, and he is informed by mail of the action taken. Typically, an initial action is to place the subject on probation for a minimum of one year, which was by far the predominant form of action taken in this study (Coppin et al. 1965, pp. 4,5).

Kaestner and Syring (1967a,b) studied the effectiveness of the Oregon hearing, a structured, informational and motivational, one-on-one session with a driver examiner. During this advisory-type meeting, the driver's record was examined in detail. According to Kaestner and Syring (1968, p. 111), the interview procedures were:

> developed with the rationale of dealing with types of problems drivers have, as contrasted to types of problem drivers. The five-part interview devised involves supplementation of the interviewee's knowledge of traffic laws, modification of his self-concept as a driver, and the generation of the counter-motives to alleviate the potential impact of the driver's unfortunate attitudes towards the driving situation. All

interviews are individually conducted and typically varied from 35 to 50 minutes each.

According to Henderson and Kole (1967b), the intent of the New Jersey face-to-face hearing was diagnostic and therapeutic. The two- to three-hour session represented a clinical approach, and included a questionnaire, initial interview, a law test, psychological and psychophysical tests, counselling, and a possible road test. Similar to the Oregon hearing, the session also focussed on the driver's record and needs.

As noted by Kaestner (1968), evaluations of these interventions found each to be effective in reducing traffic violations. The hearings in Oregon and New Jersey also had a positive impact on post-treatment accident experience.

Although the studies indicated generally beneficial effects of the individual hearings, the treatments produced varying effects for different subgroups of drivers. For example, Kaestner and Syring (1967a,b) reported that hearings had the most favourable effect on the youngest drivers; Henderson and Kole (1967b) found that clinical sessions had the least effect with the youngest drivers and with drivers previously involved in fatal accidents. Coppin et al. (1965), however, reported that "the various age groups did not appear to have been differentially affected by the hearing process". These results suggest that, while the three hearing types appear to be effective interventions, advisory and clinical one-on-one contacts have differential effects on driver improvement depending on the driver's age. The suspension hearing, however, produced no differences among the age groups. Because these results are based on only three studies, relationships between type of hearing and driver age remain ill-defined.

The California study also suggested that the hearing itself may not be the most important factor in improving driver behaviour. Coppin et al. (1965) found that subsequent driving records of those who attended their scheduled hearing did not differ from those of drivers scheduled for hearings but who did not attend. Needless to say, this finding was

contrary to expectation: the hearing, if effective, should have resulted in improvement among attendees compared to those who did not attend. Since no differences were found between the two groups, Coppin et al. (1965) speculated that "the primary source of the hearing program's effectiveness lies in communicating to the subject the possibility of impending action, rather than due to the face-to-face interaction with the hearing analyst" (p. 21). Interpretation of these results is difficult, however, in that the "did not appear" drivers were automatically suspended, and subsequently could not legally drive. Assuming some degree of compliance with this driving restriction, the incidence of accidents and citations for this group of drivers should have been reduced. Also, the more severe action (suspension versus hearing attendance) imposed on the "did not appear" group could have had beneficial effects as well. Thus, several factors unrelated to the hearing itself could have masked any positive treatment effects.

In summary, early evaluation studies have shown that individual hearings have positive effects regardless of the nature and content of the treatment. The treatment effects, however, have largely been demonstrated on convictions. There is some evidence of differential age effects -- the youngest drivers respond more favourably to advisory hearings and less so to clinical approaches than older drivers. Early results from California also suggested that receiving a notice to attend a hearing may be a driver-improvement tactic in its own right.

3.2 Recent Evaluations of Individual Hearings

In this section, we review more recent evaluation studies on the effectiveness of individual hearings on driver performance. The results of these studies generally confirm earlier findings that individual hearings are effective in reducing the number of subsequent convictions. Moreover, several investigations in California suggest that personal one-on-one contact can be an effective accident-reduction measure. As is the case throughout the driver-improvement literature, there is other evidence (this time from Wisconsin) that contradicts predominant findings.

3.2.1 New York. During the early 1970's, the New York State Department of Motor Vehicles introduced a Problem Driver Interview Program (PDI). The program involved a one-on-one meeting between a traffic violator and a DMV representative to discuss the driver's record. As described in the program evaluation (New York State Department of Motor Vehicles 1977, p.1), the objectives of the meeting were:

> to convey to the driver a sense of concern on the part of the Department about his driving record; to remind him in a low-keyed and non-threatening manner that such continued violation and accident activity might endanger his driving privilege, if not his life; and if possible to suggest methods and/or alternatives that might help the individual improve his driving performance.

The program was based on the view that "personalized and non-threatening forms of driver improvement promotion were more effective than the more traditional, structured, institutionalized and threatening forms". As such, using Marcus' (1979) scheme, the PDI can be classified as an advisory hearing.

To become eligible for a meeting, a driver had to accumulate 7 to 10 point convictions and one accident in 18 months. The effectiveness of the program was determined by randomly assigning eligible drivers to a no-contact control (N=2,612) group and a PDI treatment (N=2,886) group. The accident and conviction experience of the treatment and control groups were compared for six, twelve, and eighteen month periods prior to and following treatment.

Post-treatment analysis revealed that interview attendees had significantly fewer convictions (but not fewer accidents) than the control group for the first six-month period. Interview attendees had significantly fewer post-treatment accidents and convictions than the control group for the 12 months following treatment. An analysis of the proportion of accident-free and conviction-free drivers, however, showed no significant differences between interview attendees and controls for six, twelve, and eighteen months.

Although this evaluation study showed that PDI had a positive impact, especially for the twelve-month period, this study inadequately tested personal-interview effects because of sample-selection bias. The investigation included only those subjects who attended the interview, a group of drivers that may be different in composition from the control group. Indeed, the investigators observed pre-treatment differences in accident and conviction frequency between interview attendees and controls yet made no effort to adjust for such biases. Thus, the post-treatment results may reflect initial differences in these groups rather than treatment effects. The extent to which the sample was biased cannot be determined, given the information provided in the report.

3.2.2 Virginia. Lynn (1981, 1982a,b), in her evaluation of driver-improvement program in Virginia, reported on the effectiveness of a combination of treatments -- a personal interview and a driver-improvement clinic -- on accident and conviction experience. Subjects were randomly assigned to two groups: (1) a treatment group of drivers receiving a personal "diagnostic" interview with a driver-improvement analyst along with a driver-improvement clinic (an 8-hour course of classroom instruction held over a 4-week period) and/or probation; and a no-contact control group. Given that the personal interview represents a later stage in the driver-improvement process, both treatment and control group drivers could have received previous treatments such as warning letters and/or group meetings.

An examination of six-month post-treatment driver records showed that the treatment group had significantly fewer major convictions, but not minor convictions and accidents, than the control group. The personal-interview group had significantly fewer minor convictions as well as major convictions at 24 months. Treatment and control group survival curves indicated that the personal interview effectively reduced the post-treatment conviction rate during the first twelve months. Its impact did not extend beyond this period.

Thus, the combined personal interview and driver-improvement clinic treatment had a beneficial impact on convictions and increased the

length of time to "conviction failure". The combined program did not appear to result in accident reductions. Unfortunately, no effort was made to separate the effects of the personal interview from those of the driver improvement clinic or the probation alternative.

3.2.3 California. In California there has been considerable effort directed towards evaluating innovative, individual driver-improvement treatments. For example, Ratz (1978) describes an evaluation of a driver-improvement program for drivers applying to renew their license whose prior 3-year record showed at least two accidents, or one accident and three convictions, or four or more convictions. These drivers represented approximately 7% of the renewal population. The primary intent of this effort was to simplify the license renewal process for drivers with good records and provide more in-depth testing for drivers with poor records.

Drivers meeting the criterion for inclusion in this study were randomly assigned to one of three conditions. Each group consisted of approximately 6000 drivers. The first group (control) underwent the standard renewal process; the procedure consisted of a test of visual acuity and a 36-item written test. The second group did the vision test, completed a new 45-item written test, and viewed a film on defensive driving. The third group performed the vision and 45-item tests but were also required to pass a diagnostic driving test. At the conclusion of the in-car test, there was a 5-minute counselling session, the intent of which was to help drivers recognize shortcomings in their driving habits.

An examination of driving records one year later revealed the drive-test group had fewer convictions than controls, but were more likely than controls to have been involved in a fatal or injury crash. The group that viewed the film did not differ from the control group. No comparisons were made between the drive-test and film groups.

The results of this study appear to indicate a beneficial effect of diagnostic drive tests for high-risk drivers at least in terms of

subsequent convictions. However, the 17% higher fatal/injury crash rate of the drive-test group was obviously inconsistent with the goals of the program. Moreover, the lack of direct comparisons between the two treatment groups renders it impossible to conclude that diagnostic driving tests with counselling had any beneficial effect on subsequent driving beyond that of simply viewing a defensive-driving film.

Helander (1984) described a recent evaluation of several strategies for selecting and treating accident-involved drivers in California. The (then) current strategy required drivers involved in either a fatal accident or three accidents in a one-year period to attend a standard diagnostic reexamination treatment. As described by Helander (1984, p. 27):

> the reexamination, conducted by a Driver Safety Referee (DSR) one-on-one with the driver, consists of vision, knowledge, and driving tests, as well as an investigation of the circumstances surrounding the accident(s). Based on reexamination results, action may be taken against the driving privilege (including probation, restriction, suspension, or revocation) or the individual may be referred to a subsequent driver improvement treatment.

The reexamination, therefore, served as a diagnostic or screening process to identify drivers who require licensing actions or subsequent driver-improvement treatment. According to Helander (1984, p. 24), "implicit in the reexamination are assumptions that (1) accident-involved drivers may be deficient in the knowledge and/or skills necessary for safe driving; (2) these deficiencies may contribute to accident involvement; and (3) reexamination will reveal these accident-contributing deficiencies".

Helander (1984) randomly assigned drivers to four treatment conditions based on two selection criteria: the accident-involvement criterion and another that included drivers involved in a combination of accidents and convictions. The four treatments consisted of: a no-contact control condition; the reexamination procedure as described above; a one-on-one accident-avoidance session consisting of a discussion of accident-avoidance techniques using drivers' personal accident experience

(behaviour-modification approach); and a mailed pamphlet that described specific accident situations and avoidance techniques, along with a self-administered test. Subjects identified by the standard and expanded criteria were assigned to accident avoidance and pamphlet/self-test treatment. The reexamination treatment was applied only to subjects selected by the standard criteria since there was no interest in evaluating the effect of reexamination on the expanded-criteria groups.

The study involved an examination of the one-year, subsequent driver records (mailing date of the notice to appear) of all subjects selected for treatment, whether or not they actually received treatment. Pre-treatment analysis revealed that the treatment and control groups were similar in terms of biographical and driver-record variables. Post-treatment analysis of accident and conviction means revealed that:

> Both the reexamination and accident avoidance session drivers selected by standard criteria (accident-involved only) had significantly lower subsequent accident means (21% and 23%, respectively) than the control group but not the pamphlet/self-test drivers (12% lower but not significant). A reanalysis of the standard criteria reexamination group showed that the overall positive treatment effect was largely due to a reduction among drivers selected by the three accident, rather than the fatal accident criteria.
>
> None of the standard criteria treatment groups were significantly different from the control group on subsequent convictions although the accident avoidance session appeared more effective than the reexamination.
>
> None of the expanded criteria treatment groups were significantly different from the control group on subsequent accidents and convictions. A reanalysis of expanded criteria subgroups, however, showed a significant reduction in subsequent accidents (23%) for "minimum conviction" drivers ("most-like" standard criteria drivers) receiving the pamphlet self-test treatment and a non-significant reduction for those receiving the accident avoidance treatment. Further reanalysis showed that expanded criteria drivers with more extensive conviction records were not significantly affected by treatments.

Cost-benefit analyses showed that 1) with the standard selection criterion, all treatments were cost-beneficial, especially the accident avoidance session; 2) with the expanded selection criterion, only the accident-avoidance treatment was cost-beneficial and 3) with the "minimum" selection criterion, the pamphlet/self test was more cost-beneficial than the accident-avoidance session.

According to Helander (1984, p. 38), "the most significant finding of this study is the amenability to treatment of drivers selected on the basis of accidents rather than convictions", with the possible exception of drivers involved in fatal accidents. He also concluded that given similar beneficial effects of both the accident-avoidance and reexamination treatment, the "content of the intervention is perhaps not as important as the intervention per se". Since the pamphlet/self test treatment for the minimum-conviction group, which was most like those selected using the standard criterion, was also effective in reducing accidents, he referred to Goldstein's (1973) early observations "that drivers selected on the basis of accidents are simply more amenable to treatment than drivers selected on the basis of convictions".

The results of the investigation, however, suggest that conviction history is an important factor that can mitigate the effectiveness of treatments on accident-involved drivers. Helander (1984, p. 39) proposed two explanations for this finding:

> The first explanation would argue that a history of convictions is symptomatic of underlying psychological traits (such as aggressiveness, risk-seeking, or resistance to authority), which are also associated with reduced responsiveness to treatment, and that accident-involved drivers with extensive conviction histories are inherently different from accident-involved drivers with minimum conviction histories.
>
> The second explanation would argue that factors associated with the processing of traffic violations (such as contact with law enforcement, the courts, or traffic violator schools) diminish subsequent responsiveness to treatment, either through treatment effects of their own or by developing in the driver an aversion to further governmental intervention.

Based on the results of this study, Helander (1984) recommended that the accident-avoidance session replace the reexamination for standard-criterion drivers and that the pamphlet/self test treatment be implemented for expanded-criterion drivers with two or fewer convictions in the prior two years.

Prior to 1981, California's negligent-operator program included several stages at which certain types of problem drivers could be required to attend an individual hearing. The nature and characteristics of these individual treatments varied depending on the number of convictions and accidents accumulated by the driver and whether or not the driver had had previous treatments (such as warning letters and/or group meeting). Peck and Kadell (1983) reported on the effectiveness of the individual hearing and the probation-violator hearing. As described by the authors, "drivers who violate after attending a Group Education Meeting are required to attend an individual hearing where some form of restrictive action is taken against the driver, usually a one-year probation. Drivers who violate during their probation are required to attend a probation violator hearing which often results in a suspended or revoked license" (Peck and Kadell 1983, p. 7,8). These one-on-one meetings form part of a "progressively graduated sequence of treatments" and are typically applied to the chronic offender.

An examination of the post-treatment driver records of treatment and control groups showed that both the individual hearing and the probation-violator hearing were effective in significantly reducing convictions and accident frequencies. A comparison of survival curves (proportion of drivers accident-free for each month since treatment) indicated that the positive effects occurred primarily in the six months following treatment. The individual hearing and the probation-violator hearing were shown to prevent an estimated 18.8 and 9.2 accidents per 1,000 drivers treated, respectively, and both were found to be cost-beneficial.

Since 1981, California's negligent-operator program has been redesigned to reverse declining effectiveness and to emphasize sanctions and the

threat of their imposition. As discussed in the previous section, initial treatments involve first a warning letter and then a second-level warning letter that serves as a notice of intent to suspend. Drivers who continue to violate and/or who become "negligent operators" (four or more points in 12 months, six or more points in 24 months, or eight or more points in 36 months) are sent an order of probation with a six-month suspension. Such drivers can request and attend either an informal or formal hearing to contest the licensing action. The informal hearing involves (1) an initial group session in which a Driver Safety Referee (DSR) explains the driver's rights, the legal basis of DMV's action, traffic-safety issues, and the terms of probation; and (2) a short informal individual hearing where the DSR answers the driver's questions, discusses the driver's record and suggests improvements, and explains conditions of probation and sanctions for violating conditions of probation. If the driver requests a formal hearing, an individual hearing is then scheduled.

Of interest, the California Department of Motor Vehicles takes into account mileage when taking action based on negligent-operator points. Basically, the order of probation and suspension can be set aside if the negligent operator drives 25,000 miles or more per year. This group of drivers would be allowed to accumulate two additional points before DMV action. As of July 1, 1985, however, the mileage criteria was replaced with a similar provision for drivers who operate large trucks and buses and/or large motor-vehicle combinations.

The new approach in California also includes an alcohol-probation hearing, which is triggered by alcohol- or drug-related convictions. As in regular probation hearings, drivers who receive orders of probation with a special alcohol clause and a six-month suspension can request an individual hearing that lasts about 30 minutes and focuses on problems associated with alcohol and/or other drugs. In the majority of regular and alcohol probation hearings, the six-month suspension is set aside and the probation remains in effect, usually for a one-year period.

Marsh and Kadell (1985) report that the probation hearing reduced the number of drivers cited (convictions and notices of failure to appear in

court) from 280 to 217 per 1000 drivers treated after the first six months. This represents a significant 22.5% reduction in drivers cited. No analyses of accident data or the separate effects of regular or alcohol-probation hearings were provided in this preliminary evaluation of the treatments.

In summary, findings from California indicate that several individual-hearing programs have potential for improving the performance of certain problematic drivers. In particular, Helander (1984) demonstrated dramatic reductions in post-treatment accident means of more than 20% compared to controls for the standard diagnostic reexamination and the accident-avoidance session. Drivers most amenable to treatment had a record of accident involvement with a minimum number of convictions. Although the individual treatments had a significant impact on subsequent accidents, they did not have a similar effect on subsequent convictions, regardless of the driver-selection strategy (accident versus conviction histories).

Evaluation of the regular Negligent Operator Program demonstrated that the individual hearing and the probationary-violator hearing have beneficial impacts on subsequent convictions and accidents, for atleast a six-month period. More recent evaluations of the new system in California also illustrate the conviction-reduction benefits of the probation hearing. Since the outcomes of these hearings are typically probation, suspension, or revocation, it is not possible to differentiate effects of the hearing from the effects of subsequent licensing action (See Section 5.0 for a review of studies that describe the effectiveness of such licensing actions.)

3.2.4 Wisconsin. In Wisconsin, Fuchs (1980) evaluated the effectiveness of the Driver Improvement-Individual Counselling Program (DI) for habitual traffic violators. In this report, the author provided no description of DI counselling other than to refer to the session as an educational program.

Drivers who were eligible for DI were randomly assigned to the following groups: DI after revocation/suspension treatment (DI-RS); DI after

accumulating 7 to 11 demerit points in a 12 month period treatment (DI - 7 - 11); and two corresponding control groups.

The driving records of 84,300 DI drivers and 10,768 control drivers were examined for the first year following treatment. The percentage of drivers having at least one conviction and one accident was lower among controls than DI drivers during the first year following treatment. Moreover, a comparison of controls and DI treatment according to the two reasons for referral to DI showed no beneficial effects of treatment although the DI-R/S group had better records than DI-7-11 group drivers. Standardizing the data to adjust for potential sampling bias (i.e., controlling for potential differences between groups for age, sex, and area of residence) and examining the driving records two and three years following treatment also produced similar results -- no indication that treatment had a beneficial effect on conviction and accident rates. In fact, Fuchs (1980) observed that statistically significant differences generally indicated better performance among control-group drivers than DI-counselled drivers. Moreover, significant treatment-control differences were found when the analyses included age and sex comparisons. Thus, in Wisconsin, the Driver Improvement-Individual Counselling Program appears to have failed to improve driver performance.

3.3 Summary

Although individual hearings have taken various forms, hearings can be categorized as three types of face-to-face meetings: suspension, advisory, and clinical-diagnostic interviews. Early evaluation studies in California, Oregon, and New Jersey have indicated positive effects of individual hearings, particularly on subsequent collision involvement, regardless of the type of treatment. Thus, some evidence suggests that the effectiveness of this form of driver-improvement action may be attributable to the fact of intervention per se (even just receiving a notice to attend) rather than to the hearing itself.

Most (but not all) recent evaluation studies generally confirm earlier findings, namely, that individual hearings can result in lower conviction rates. Importantly, several investigations in California found

significant reductions in accidents subsequent to treatment. Similar to the early California work, Helander (1984) suggested that the content of the individual hearing may not be as important as the intervention per se. Moreover, he reported that drivers most amenable to treatment were accident-involved drivers with a minimum of convictions. These results underscore the importance of considering drivers' accident and conviction histories in matching them with different driver-improvement programs.

4.0 GROUP PROGRAMS

Kaestner (1972) briefly recounted the history of driver-improvement programs and described "a progression from procedures requiring individualized in-depth studies of a few errant drivers to semi-automated processing of masses of drivers at more superficial levels" (p. 350). The proliferation of motor vehicles and greatly increased numbers of licensed drivers forced a shift away from "individual diagnosis and treatment" to less personal means of dealing with greater numbers of "problem drivers". A compromise was to retain direct, in-person contact with such drivers through group hearings, meetings, or courses. Cost considerations rather than the inherent effectiveness of group sessions appear to explain this trend.

Marcus (1979) reviewed studies of the effectiveness of group meetings and found a lack of consensus among investigators:

> Kaestner (1968) and Goldstein (1973) both question whether group approaches have any effect on subsequent driving behaviour, and do so by a fine-grain examination of the studies showing positive results with group treatments. McGuire (1976) and Peck (1976) are less categorical and argue that more and better research is needed before the comparative effectiveness of the two approaches can be adequately assessed. (p. 40)

Following a review of the referenced studies, Marcus (1979) concluded that group meetings have "at worst a neutral effect and at best some positive effect in reducing traffic violations" but not accidents (p. 43).

Results of recent studies have tended to support the view that group-based programs have an acceptable degree of effectiveness. For example, as shown in a cost-benefit analysis by Kadell and Peck (1979), a group-educational meeting proved more cost-beneficial than three other widely used programs (warning letter, individual hearing, and probation hearing) when adjustments for follow-up treatment costs were taken into account. Generally favorable evaluations and cost-effectiveness studies have encouraged reviewers to recommend retention of these kinds of

programs in driver-improvement systems (e.g., Li 1980; Weidman et al. 1982a). Investigations in California, however, have resulted in major modifications in their negligent-operator program, including the discontinuance of the group meeting because of declining effectiveness and benefit-cost figures (Wootton et al. 1981; California Department of Motor Vehicles 1985).

Group meetings for licensed drivers are generally aimed at "rehabilitating problem drivers" -- those individuals who have acquired one or more violations and/or accidents over a certain period of time. Typically, a group meeting is the second contact with driver-licensing authorities, following a warning letter if an individual continues to accumulate points for violations or accidents. A group meeting can also be the initial contact if a driver is convicted of a more serious traffic offense and thus bypasses the advisory-letter stage. Some court-affiliated programs also allow drivers to attend meetings either as a way to remove points from their driving record or as an alternative to other driver-improvement actions. The explicit or implicit intent of most group meetings is to improve drivers' knowledge, attitudes, and, ultimately, driving behaviour by means of educational and group-interaction techniques.

Group meetings can be classified as three general types, although there is some overlap in content and perspective: (1) driver re-educational approaches; (2) attitude-change approaches; and emotional/motivational approaches. Formats of meetings can involve a single session or multiple sessions in which lectures, films, and/or group discussions focus on "good" driving habits and attitudes. Although format and approach differ greatly among programs, each has the primary goal of reducing the number of subsequent violations and accidents.

Subsections below review evidence of the effectiveness of group meetings. The first three subsections consider various driver re-education courses designed to improve driving knowledge and skills. The final subsection deals with attitude-change and similar approaches.

4.1 Driver Re-education Courses

The emergence and popularity of driver re-education courses reflect the premise that violations and accidents result from driver errors stemming from a lack of knowledge or skills (Ames and Micas 1972). The role of driver education is to improve driving skills and habits and thereby reduce the incidence of motor vehicle crashes among course graduates. The best known driver-education program for licensed drivers is the U.S. National Safety Council's Defensive Driving Course (DDC). This course is discussed below. Other educational approaches are then considered.

4.1.1 Defensive driving course. The DDC was initially developed in 1965 to improve the driving skills of professional drivers. The course features an eight-hour curriculum (usually spread over four sessions) and emphasizes theoretical aspects of driving. As the name of the course indicates, the concept of defensive driving is a theme that integrates the content of the session. Specifically, defensive driving has been defined as: "driving in such a manner as to be able to prevent being involved in an accident in spite of the incorrect actions of others or in the presence of adverse driving conditions" (Payne et al. 1984, p.1). Stressing specific actions drivers can take to reduce the risk of crash involvement, the DDC covers the following topics: (a) determining the preventability of an accident; (b) how to avoid a collision with a vehicle ahead; (c) how to avoid a collision with a vehicle behind; (d) how to avoid a collision with an oncoming vehicle; (e) how to avoid an intersection collision; (f) the art of passing and being passed; (g) the mystery crash; (h) how to avoid other common types of collisions (Hill and Jamieson 1978, p. 117). As outlined by McMillan (1984), the intent is to have participants (1) recognize basic errors made by drivers; (2) identify adverse conditions likely to be encountered; (3) anticipate actions of other drivers; and (4) identify and apply the basic elements of defensive driving to these situations.

Since its inception, the DDC has been used for the general population of drivers as well as for programs intended for problem drivers. The effectiveness of the DDC has been evaluated in at least four different settings:

- o driver-improvement programs for the general population;
- o driver-improvement programs for particular occupational groups;
- o driver-education programs in conjunction with school-based driver education; and,
- o driver-rehabilitation programs for drivers assigned to the program.

Recent reviews of these evaluation studies (Lund and Williams 1985; Payne et al. 1984; and Wynne-Jones 1984) indicate an emerging consensus, namely, that regardless of the setting for the DDC, the course appears to reduce subsequent violations but not crashes. For example, in their review of 14 controlled studies of the effects of the DDC, Lund and Williams (1985) concluded that:

> About a third of these studies provided methodologically strong tests of DDC, but the remainder had design flaws that made their findings questionable or inadequate as tests of DDC. Only among the flawed tests were there larger, positive effects of DDC. In the methodologically strong tests, DDC had no consistent effect on crashes but did decrease the frequency of traffic violations by about 20%. (p. 449)

Payne et al. (1984) in a review of eight evaluation studies observed that:

> In reviewing research on DDC in 1972, Planek et al. begin with the words, "Previous efforts to evaluate DDC have been non-conclusive". In this brief review of the literature a decade later the results of the DDC evaluations were still inconclusive. (p. 19)

Thus, evidence supportive of the DDC as a driver-improvement program is not substantial. The absence of strong, positive effects may be due to the fact that the DDC has been inappropriately applied to certain groups of drivers. For example, Payne et al. (1984) evaluated the DDC administered by the Queensland Road Safety Council and found that the DDC was not effective in reducing accident rates of drivers aged 17-19 or for

females older than 20 years. Significant accident reductions, however, were found for male drivers aged 20-39 years who drove as part of their work. Koppa et al. (1981) observed that the DDC is not primarily designed for problem drivers but is a general-purpose improvement course aimed at teaching drivers to rethink their personal attitudes toward traffic situations in terms of preventability. Nonetheless, several U.S. states allow drivers to remove points or citations from their record by participating in such courses, and some states require drivers with multiple citations or crashes to attend them, either in lieu of, or as a supplement to, other driver improvement actions (e.g., license suspension, administrative review) (Lund and Williams 1985).

Studies that have examined effects of the DDC on "problem" drivers are reviewed in more detail below.

Positive effects of Defensive Driving Courses (DDC) for problem drivers. Several earlier evaluation studies of the DDC in California and Oregon indicated that attending the DDC has a beneficial effect on crashes and violations. Other studies found the DDC effective in reducing only violations.

o California. Brown (1975) reported results of an experimental study in which 3,109 drivers appearing at traffic court for violations and crashes were randomly assigned to one of four groups: Trigger Response Group Participation (TRGP) course for drivers under 27 years (792 drivers); DDC for those under 27 (684 drivers); a DDC for all ages (885) and a control group of 778 drivers. Comparisons of DDC graduates to controls of all ages revealed that course graduates had significantly fewer total convictions at both six months and twelve months than did the control group of drivers. The difference in total convictions was primarily due to a reduction in moving violations. DDC graduates also had fewer accidents at six months, but not at twelve months. Brown also found that DDC graduates under 27 years of age had fewer crashes and violations after 6 and 12 months than the no-action group, but these results were not statistically significant. DDC graduates 27 years of age and older experienced fewer crashes and total convictions at six

months, but not at twelve months, compared to controls. The difference in total convictions at 6 months was due not to differences in speeding convictions but to other moving violations, including the combined category "reckless/drunk/drugs". (Results for the TRGP group will be discussed in the next section, which discusses the effects of other group approaches.)

Although Brown's study showed that the DDC was effective, especially for older drivers during the six months following treatment, Lund and Williams (1985) classified this study as weak because of problems with research design. Basically, 6% of drivers assigned to DDC failed to complete the course and were subsequently eliminated from the project. Lund and Williams (1985) contend that elimination of these drivers creates a self-selection bias since drivers assigned to treatment who fail to complete treatment have been shown to have more crashes and violations than DDC graduates. This compromises the randomness of the sample in that only a subsample of drivers assigned to DDC -- those drivers with a better driving record -- is compared to the entire sample of control drivers. It should be noted, however, that Brown (1975) employed an analysis of covariance to adjust post-course records for this type of bias. Thus, Lund and Williams' (1985) criticism seems unfair and the Brown (1975) study might be reclassified as a strong test of DDC effects.

o Oregon. Several evaluations of the DDC have been done in Oregon. For example, Kaestner et al. (1975) reported a study in which 960 drivers eligible for first-time license suspension were randomly assigned to five groups: suspension (208); warning letter (206); probationary license (222); DDC (97); and control (199). The primary aim of the study was to evaluate the effects of license suspension relative to other treatments, such as the DDC. The authors reported that both the DDC and the probationary license were more effective than other treatments in reducing subsequent moving violations or chargeable accidents. Moreover, DDC proved more effective than no-action (control) or suspension in delaying collisions or violations.

More recently, Kaestner (1980) compared the DDC with another course and with a no-contact control group. A total of 1,377 drivers eligible for treatment were randomly assigned to control (459), DDC (449) and alternative-treatment (469) groups. The groups were similar with respect to age, sex, and prior driving record. The author examined the driver records of the three groups one year after the assignment date to treatment. Drivers were included in the analysis even if they did not attend the course(s) to minimize post-assignment selection bias. This approach also allowed for an evaluation of assignment to the programs as a motivator for improved driving. The DDC was found more effective than the other course or the control condition in deterring subsequent violations and accidents. Moreover, the DDC also had a greater delaying effect on the first traffic entry in the post-treatment period. Since Kaestner combined violations and accidents in the study, no conclusions could be reached concerning the effects of the DDC on accidents only.

o Washington. Morehead and Wood (1976), in an evaluation of the Special Adjudication For Enforcement (SAFE) project in Seattle, Washington, reported on the relative effectiveness of three versions of DDC on accident and conviction recidivism following treatment. The SAFE project involved a special adjudication/referral/rehabilitation system in which traffic-law violators are adjudicated by a magistrate in an informal hearing. Magistrates were authorized to refer traffic offenders to a Driver Improvement Analyst (DIA) for diagnosis and/or counselling of problems related to safe-driving practices or to refer them directly to one of several driver improvement programs, including the DDC. The evaluation of the SAFE project included comparisons of the relative effectiveness of four treatment groups (3 versions of DDC and Control) and five alternative referral routes (predesignated [random] referral; predesignated referral with DIA counselling; predesignated referral to a DIA for diagnosis with referral to the appropriate level of treatment; magistrate-direct referral; magistrate referral to a DIA who in turn referred drivers to appropriate treatment). Morehead and Wood (1976) reported that the standard DDC had been effective in reducing both accident and violation recidivism compared to the no-treatment control group. These results were challenged, however, by Salzberg and

Klingberg (1977, 1978), who raised concerns about the validity of the research design. They demonstrated that randomization of subjects to the comparison groups was severely compromised because DIAs and magistrates excluded some offenders from their predesignated groups. Since there were differences in the type of offenders entering treatment through the various modes of referral, the observed treatment effect of DDC might be due to the "type of offender" and not the actual treatment. In reanalysing the data using preassignment irrespective of the actual assignment, they found no effect of DDC on accident recidivism but an effect on citation recidivism.

o New Zealand. Hill and Jamieson (1978) compared the driving records of 275 drivers who, because of traffic offenses, were directed by courts to the DDC in 1972 and 1973 with a sample of drivers matched according to age, sex, and prior driver record. Accident and conviction records of both these groups were examined for twelve months before and after treatment. The investigation (Hill and Jamieson 1978) used the following six measures:

1. Number of accidents

2. All accident-promoting offenses
   - 2.1 Serious offenses or those that are most likely to result in injury and death
   - 2.2 Nonserious offenses excluding speeding offenses
   - 2.3 Speeding offenses

3. Non-accident-promoting offenses

Hill and Jamieson (1978) found no significant differences between the two groups on post-treatment accidents, nonserious convictions, and nonaccident-promoting conviction variables. The DDC group, however, had significantly fewer accident-promoting convictions, including serious convictions and speeding convictions than the control group. The authors conclude that "the DDC appears to facilitate the reduction of serious convictions while having at best no superior effects on accident rates relative to other treatments" (p. 126). This observation, however, may be unreliable due to methodological difficulties in matching

the comparison groups. Specifically, there were between-group differences in pre-treatment accidents, accident-promoting convictions, serious convictions, and speeding convictions. Thus, the pattern of findings may be due to pre-treatment group differences rather than DDC effects.

No effects of defensive driving courses for problem drivers. Studies in Florida and Rhode Island report the DDC ineffective in improving driver performance. Attendance at the DDC, however, resulted in increased knowledge, but not attitude change. These studies are reviewed below.

o Florida. Prothero et al. (1978) reported a comparative evaluation of two treatments -- the National Safety Council's Defensive Driving Course (DDC) and a new rehabilitative treatment referred to as "Responsible Driving". The study participants consisted of 432 problem drivers who had lost their licenses due to traffic-law violations and/or collisions and were attempting to obtain a temporary license for reasons of hardship. The subjects were randomly assigned to the two treatment groups and a control group (license suspension), and their driving records monitored for 12 months. Prothero et al. (1978) found no significant differences between the DDC group and the control group for either the number of traffic convictions or the number of accidents experienced during the 12-month period. The study also included pre- and post-tests of all participants in each of the three groups to assess differences in driving knowledge and attitudes. In both pre- and post-tests of driving knowledge, the DDC group had significantly lower scores than the control group. Although each of the treatment groups showed an increase in knowledge from pre-test to post-test, these differences were not significant. Moreover, no significant differences were found among the three groups for the pre-test, for the post-test or for the pre-posttest differences with respect to attitudes. Prothero et al. (1978) have described their findings as tentative because of small sample size, dropouts, and possible contaminations during the conduct of the study. Lund and Williams (1985) have also rated the Florida study as a weak test of DDC due to uneven attrition after the assignment of drivers to the three study groups.

o Rhode Island. Ulmer (1978) evaluated a DDC used as a sanctioning option in the administrative adjudication of traffic violations (SAFE) in Rhode Island. No significant differences were found in subsequent accidents of a group of drivers randomly assigned to DDC compared to those assigned to a nontreatment control group. While the subsequent driver records of the comparison groups were not statistically different, the control group tended to have fewer post-treatment accidents and violations than the DDC group. A 16-item knowledge test was also administered before and after treatment to DDC attendees. Post-test scores were significantly higher than pre-test and the percentage of DDC students answering each item correctly was greater for all 16 items on the post-test. While these results suggest increases in knowledge among DDC students, no comparisons were made with the control group.

In summary, results of several studies conducted in different jurisdictions confirm earlier positive findings for the DDC. The DDC has been shown to increase knowledge and to reduce the frequency of violations among problem drivers. These effects, however, do not extend to accident reductions. Most of the studies indicate that the DDC does not have a significant effect on post-treatment accidents. A major exception is the California study by Brown (1975), which found that the DDC was effective in reducing accidents, especially for older drivers in the six months following treatment. These results are consistent with those reported by Payne et al. (1984) and, if taken together, suggest that the DDC could be an appropriate treatment for older drivers. Because no other studies considered differential effects of DDC by age of driver, and because both the Brown and Payne et al. studies have methodological flaws -- for example, Payne et al. used self-reported accident data, which are subject to memory lapses and intentional omissions -- these observations must be described as speculative.

4.1.2 Other driver re-education courses. Driver-improvement programs in several jurisdictions include other educational courses for problem drivers, which are used as alternatives to, or instead of, the National Safety Council's DDC. Like the DDC, these courses emphasize theoretical aspects of driving and attempt to improve driving knowledge, skills, and habits. Marcus (1979) reviewed the following courses:

- a driver improvement clinic program for habitual violators in New York that involved non-sequential, multiple sessions with lectures on safe driving techniques, films demonstrating the consequences of poor driving, information on driving laws, and small group discussions (Scott and Greenberg 1968);

- an 18-hour voluntary course held in the Los Angeles Adult Education program, which emphasized self-protection or defensive driving, driving in traffic without breaking the law, and personal responsibility in driving (Schuster 1968); and

- a multiple-session course in New Jersey in which accident repeaters are invited to view films, take psychological tests, and discuss topics related to the "Strategy and Tactics of Driving" (Henderson and Kole 1967).

Marcus (1979) reported that such courses have reduced post-treatment violations but not subsequent accidents. The results of several early studies not reviewed by Marcus as well as several recent studies on the effects of driver re-education courses are discussed below.

Positive efforts of other re-education courses. Several evaluation studies have found driver re-education courses effective as driver-improvement treatments but not as effective as the DDC.

o California. As discussed in Section 4.1.2, Brown (1975) evaluated three types of driver re-education programs for traffic violators -- Trigger Response Group Participation (TRGP) course for drivers under 27 years of age; DDC for those under 27 years of age; and DDC for all ages. The TRGP course, presented as four 2½ hour sessions over a period of two weeks, focussed on self-directed change through group-interaction techniques. Slides and several "trigger films" illustrated relationships between emotions and driving and the importance of attentiveness to safe driving. Subjects included drivers convicted of a traffic violation. These drivers were randomly assigned to one of the study groups, and their driving records were examined at six months and twelve months following course completion. The TRGP group of drivers under 27 experienced a significant reduction in accidents after twelve months but not in convictions. No significant effect occurred for violations and

accidents at six months. Since greater reductions were observed among the DDC group (all ages) for accidents and citations, the investigator recommended implementation of the DDC rather than TRGP as a traffic re-education programme.

We find this recommendation rather puzzling for two reasons. First, the DDC was not effective in reducing accidents for drivers under 27 years while the TRGP did significantly reduce accidents among young problem drivers at twelve months. Second, the TRGP group consisted of drivers under 27 so that no effort was made to evaluate the impact of the TRGP course on drivers of all ages. Thus, a direct comparison of the DDC and the TRGP course for drivers of all ages was not provided. Unfortunately, the author provides no further explanation of their preference for the DDC.

o Oregon. Kaestner (1980, 1983) compared the DDC to the Traffic Violator Workshop of the National Traffic Safety Institute (NTSI). The Traffic Violator Workshop is a one-day, eight-hour course that focuses on the role of attitudes in driving through films, questionnaire workbooks, and group-interaction techniques. An examination of the driving records of the NTSI, DDC, and control groups one year subsequent to assignment date revealed that the DDC was significantly more effective than NTSI in reducing a combination of citations and chargeable accidents. Both courses, but especially the DDC, had a longer delaying effect on subsequent moving violations and chargeable accidents compared to the control group. When only those drivers who completed their course are considered, the DDC seemed more effective in preventing subsequent accidents and violations than the NTSI one-session course.

Kaestner (1980) speculated that the better performance of DDC graduates may be due to the fact that NTSI had only recently been introduced in Oregon and certain problems -- for example, with course content -- had not been solved. As an initial test of this hypothesis, he examined a second sampling period several months later. This analysis produced similar results, but the differences between DDC and NTSI were not as great. In another evaluation of the two courses, Kaestner (1983) found

a significant improvement in NTSI-course results. The investigation revealed no significant differences between NTSI and DDC in chargeable accidents and convictions. Unfortunately, since no control group was employed, the overall effectiveness of these courses could not be determined.

No effects of other re-education courses. Several jurisdictions have found driver re-education courses ineffective in improving driver performance.

o Washington State. Salzberg and Klingberg (1977) compared the effectiveness of three versions of the DDC: (1) the standard DDC eight-hour classroom course; (2) a Programmed Learning Version of the DDC course consisting of tape-recorded lectures, a student workbook, and four hours of classroom instruction; and (3) a Second Programme learning course consisting of the same recorded materials, self-instruction work, and a one-hour classroom meeting for testing purposes. As discussed previously, they found no effect of the DDC on accident recidivism but an effect on citation recidivism. With respect to the two Programmed Learning courses, neither reduced post-treatment crashes or violations.

o California. Peck et al. (1980) evaluated the Traffic Violator School (TVS) accreditation program. In this court-affiliated program, drivers cited for a traffic violation could have the offense dismissed (and not recorded on their driving record) if the violator agreed to attend a TVS in lieu of standard sanctions of fine and/or jail. Typically, the TVS involved the DDC or National Traffic Safety Institute (NTSI) courses (see Kaestner 1980, 1983 and the earlier discussion of the Traffic Violator Workshop in Oregon for a more detailed description of this type of course). The courses included a minimum of eight hours of classroom instruction covering driving attitudes, the use of alcohol and drugs, defensive-driving behaviours, traffic laws, and safety-related vehicle maintenance. In the Peck et al. (1980) study, subjects consisted of 14,278 violators assigned by courts to traffic schools. When these violators went to school to register, they were randomly assigned to either a school waiver (control) group or a treatment group.

Due to misassignment of drivers who should have been in the school waiver (control) group to the treatment group, Peck et al. (1980) used various statistical techniques to adjust for potential bias that could confound interpretations of subsequent driver-record differences. With possible assignment bias taken into account, results indicated that TVS had no significant effects on either subsequent accidents or convictions. Moreover, an examination of different school types (private or public) and session-course formats (single or multiple sessions) revealed no significant differences in driver performance.

In summary, evaluations of the effectiveness of various re-education courses other than the DDC have generally found that this type of course fails to improve driver performance. Moreover, compared to other courses, the DDC was more effective, particularly with respect to reductions in violations among participating drivers.

4.2 Attitude-Change and Emotional/Motivational Approaches

Several jurisdictions have implemented driver improvement programs designed to change drivers' attitudes through educational and emotional/motivational approaches. Studies that have examined the effects of group meetings that employ these techniques are reviewed below.

4.2.1 Positive effects. Attitude-change meetings have had positive impacts on violations and, in some cases, accident records of problem drivers. In particular, early evaluations of group meetings in California provided supportive evidence, although more recent findings are less encouraging.

o Washington. Marcus (1979) reviewed a group-dynamics program in the State of Washington. In three, two-hour sessions, this program featured role-playing techniques to help participants appreciate police officers' situations better and to understand the ramifications of possible law suits (Kastelle and Le Sueur 1965). An evaluation of this treatment showed violation reductions but no accident reductions for course attendees compared to controls in the posttreatment period.

o California. Marcus (1979) also reviewed a series of studies (Coppin 1962; Coppin, Marsh and Peck, 1965; Marsh 1971, 1973, 1978) that examined the impact of California's group meetings. Studies in the early 1960's had showed that group meetings were effective in reducing violations but not accidents. Because California was primarily interested in accident reduction, the standard group meeting was revised, producing a new educational treatment called the Group Educational Meeting (GEM). The GEM is a 1½ hour session in which a Driver Improvement Analyst (DIA) "tries to 'sell' participants on the necessity for change and assist them in identifying the means by which this could be accomplished" (Marsh 1978; Marcus 1979). The underlying premise of the approach is that "lenient treatment would result in significantly greater subsequent driver improvement than more severe actions, because it leaves the driver with the notion that he is still 'basically good'" (Marsh 1978).

The studies of the GEM revealed significantly reduced posttreatment violations as well as accidents in comparison to controls. Reviewing the Marsh study, Marcus (1979) thought that the beneficial impact of GEM could be attributed to voluntary as opposed to mandatory attendance. For example, more cooperative and suggestive drivers might attend the meeting, those most likely willing to improve their driving. Although the GEM was originally not mandatory, Marsh (1978) had indicated that interest in increasing the 50% attendance rate to maximize program impact led the DMV to require attendance under threat of suspension for those drivers who had incurred an additional violation after receiving a warning letter. Moreover, Marsh (1978) cited a study by Kadell et al. (1977), which showed that "the GEM program with mandatory notice is effective in reducing accidents and convictions". In fact, one of the major questions posed in the Marsh study (1978) was whether the change to a mandatory meeting notice actually reduced program effectiveness.

In addition to assessing the impact of mandatory versus voluntary treatment, Marsh (1978) examined the comparative effectiveness of several treatments. These included:

- The standard 1½ hour mandatory group educational meeting (GEM).
- A programmed home self-instruction treatment (HI).
- A home-instruction, point-reduction incentive treatment whereby participants who completed it and returned the answer sheet were eligible for a removal of one negligent driving point with six months of accident- and violation- free driving (HI/PRI).
- A 1½ hour voluntary session containing materials aimed at enhancing negligent operators' perceptual strategies called Training In Perceptual Skills (TIPS). The HI was also administered preceding TIPs and combined with HI/PRI.
- A three-hour voluntary session which added attitudinal related subject matter called Combined Attitudes and TIPS (COMBAT). The HI was also administered preceding COMBAT and combined with HI/PRI.
- A three-hour mandatory version of the COMBAT called Mandatory Combat (M/C). The HI was also administered prior to M/C and combined with HI/PRI.
- A no-treatment group (Control).

Subjects included over 17,000 drivers who met the following computer-based criteria and who would have been notified to attend GEM:

- 3 to 5 conviction points in the past 12 months;
- not attended a GEM or Negligent Operator hearing;
- if less than five points in the past year and a warning letter and (a) at least one reported accident in the last 12 months or (b) four conviction points in the last 12 months or (c) at least six conviction points in the last 24 months or (d) at least eight conviction points in the last 36 months.

Between 10-15% of subjects were assigned by Driver Improvement Analysts (DIA) because they felt that these drivers would benefit from GEM. The DIA-assigned subjects were similar to the other subjects but did not meet the computer criteria.

Subjects consisted of all assigned drivers to original treatment even though misassignment to treatment occurred, and some treatment subjects did not actually receive or complete all aspects of the treatment. Marsh (1978) referred to Coppin et al. (1965) in explaining the rationale for using all assigned subjects regardless of actual treatment:

> The reasons for this approach are readily apparent when we consider the composition of the control group, and the possible differences among the appeared and control groups other than treatment effects.
>
> In the first place, we assume that if the control group had received a Driver Improvement meeting (DIM) notice, it would have the same proportion of subjects as the meeting group falling in the appeared, non-appeared, and notice returned categories. Also, even if the meetings had no effect, those persons who took the trouble to attend a meeting might differ from persons who did not, in respect to driving behavior. Since they cannot be identified in the control group, comparing only the appeared category from the meeting group to the entire control group might 'stack the deck' against one of the groups.
>
> From another standpoint, a comparison of the control group and the entire meeting group is not only scientifically correct but also very practical. If one were trying to decide whether to continue or terminate the DIM program in its present form, it would be important to know the overall effect of the program. In other words, one would want to know whether the entire process of sending out notices and conducting meetings reduced accidents and violations. It would not be enough to know that accidents and violations were reduced for those persons who attended the meetings, if accidents and violations actually increased among persons who received the invitations but did not attend. (p. 56)

Marsh (1978) examined accident and conviction means for each treatment group during the one year after assignment. This time interval was further divided to consider driver records in the first and second six-month period. He reported that the GEM group did not have significantly fewer accidents than the controls group, although accident means for GEM were lower than the controls in the first six months. These results are markedly different from those reported by Kadell et al. (1977), who found that GEM significantly reduced accidents compared to a

control group in the first 6 months. Marsh (1978) explained that this apparent contradiction arose from several differences in methodology:

- Kadell's criterion to measure treatment effects was the proportion of persons who were accident-free during a six month period, whereas Marsh used the mean number of accidents.
- Kadell's study allowed subjects to be included without waiting a full six months post-meeting interval; in Marsh's study all subjects had at least 18 months post-meeting interval.
- Kadell's findings were based on total accidents; Marsh's included only California Highway Patrol accidents (excludes out-of-state reports and reports filed by drivers directly to DMV). (pp. 73,74)

In reanalysing Kadell's data using comparable information, Marsh obtained results that were consistent with his initial findings -- no significant difference between GEM and Control in posttreatment accident means. When both samples were combined, however, the GEM was found to have significantly fewer accidents than the Control group during the first six months but not the second six months after the assignment date. The primary effect of combining the two samples was to more than double the number of subjects for the GEM and Control groups, which increased the power of the test and thus resulted in statistically significant differences.

Based on original data analyses, the three new classroom treatments (TIPS, COMBAT, M/C) were not effective in reducing accidents compared to the controls. Among the non-classroom treatments (HI and HI/PRI) only HI/PRI had significantly fewer accidents than did the controls. This accident-reducing effect, however, did not occur until the second six-month period after treatment. (See Section 6.0, which deals with incentive programs, for a more detailed discussion of results for HI and HI/PRI.)

In considering data on convictions, Marsh (1978) found that all treatments except the HI had significantly fewer convictions than the control group during the whole year as well as during the first and second

six-month periods after the assignment date. Finally, comparisons among treatment groups produced the following results:

- o no evidence that a 3-hour classroom presentation (COMBAT) including attitudinal subject matter was more effective than a 1½ hour (TIPS) course;
- o no evidence that a mandatory notice (M/C) produces better results in accidents or convictions than a voluntary treatment (COMBAT);
- o the GEM was generally more effective than the new classroom treatments with the possible exception of M/C in the second six months.

Thus, Marsh (1978) concluded that the GEM is the most effective treatment for reducing accidents, at least during the first six months of posttreatment. The favourable results for GEM, however, were only obtained after doubling the sample size and subsequently increasing the power of the statistical test in the analysis. Unfortunately, increases in sample size for other treatments were not possible. What effect larger sample sizes would have had on the results for those treatments is not known. It should also be noted that the California studies have been criticized for using a relatively low probability level (.10) as statistically significant (Marcus 1979). The rationale for using the .10 significance level is discussed in considerable detail by Marsh (1978, p. 34-37), a rationale the present authors accept as fully justified.

In a report on California's evaluation system -- Post-Licensing Control Reporting and Evaluation System (PLCRES) -- Peck et al. (1983) provided further effectiveness data on GEM. Peck et al. report that GEM significantly reduced the proportion of persons having accidents in the first six months after treatment compared to a control group. The number of accidents prevented by GEM were estimated to be 17.1 per 1000 drivers treated. The GEM was also shown to reduce post-treatment convictions significantly, a 9% decrease in the proportion of drivers convicted of traffic offences. Nonetheless, the ongoing evaluation of GEM and other components of California's negligent-operator program indicated a decreasing effectiveness of these various treatments (Wootton et al.

1981). As a result, California modified its program and the new approach dropped the GEM as a treatment of problem drivers.

o Florida. Prothero et al. (1978) compared the effectiveness of the National Safety Council's DDC with a new treatment based on the principles of transactional analysis in Florida. The new treatment, referred to as "Responsible Driving" (RD), focussed on helping participants learn to accept responsibility for their actions, especially while driving. The RD course employed group discussion, role playing, decision-making techniques, lectures, films, and other media. It was designed to encourage "participants to express their feelings and ideas while learning to increase their self-awareness, driving knowledge, and, above all, willingness to perform in a responsible manner while driving" (p. 58).

Based on driving records of the groups one year following treatment, the RD group had fewer violations than did either the DDC or the control groups, and, moreover, the RD group had experienced a significantly greater reduction in collisions than the control group. The RD group was also shown to have significantly higher posttest knowledge scores than the DDC group but not the control group ($p < 0.10$). The knowledge increase from pretest to posttest for the RD groups was not significantly different from that of the other two treatments. No differences were found in attitude-related test scores. The authors concluded that the RD treatment was significantly more effective than no educational treatment and somewhat more effective than the DDC. Due to methodological problems (different rates of subject attrition), however, these results must be treated with considerable caution.

o Texas. Koppa et al. (1981) described the results of a demonstration project to evaluate the effects of a combined educational (attitude-change) course and either adjudicative or administrative assignment of young drivers aged 16-25 eligible for license suspension. The course, called "Driver Responsibility in the Seventies" (DRIS), also applied aspects of Transactional Analysis ("I'm O.K. You're O.K.") to assist participants in modifying their behaviour and thus improving

their driving records. The course was eight hours in duration; used films, slides, and tape cassettes; and featured group discussions and role-playing to encourage participants to consider their personal driving habits with the aim of self-evaluation and change. Koppa et al. (1981) outlined the course as follows:

Part I is used with multi-media and discussions:

A. Developing Positive Driver Attitudes and Feelings

B. Understanding Traffic Environments

C. Observing Traffic Laws

D. Driving Within the Forces of Nature

E. Practicing Good Vehicular Maintenance

Part II combines multi-media discussions, role playing, and other relative activities:

A. Utilizing Good Seeing Habits

B. Mastering Driving Tasks

C. Understanding Driver Impairments

D. Identifying Driving Hazards

E. Preparing for Emergencies and Avoiding Accidents.

Two modes of random assignment to treatment were 1) notification by mail from the Texas Department of Public Safety (DPS) of their status as a "problem driver" and of assignment to a DRIS class (Direct Citation) and 2) petition into court by DPS and assignment to DRIS (Petition). A third group of drivers consisted of individuals who could have been assigned to DRIS either by Direct Citation or Petition but were randomly assigned to control. No action was taken on these drivers. Subjects included more than 11,000 drivers, including drivers under the age of 18 who received two violations in a 12-month period (Provisional Violator) and those 18 to 25 years-old who had four violations in a 12-month period (Habitual Offenders). Using multiple-regression analysis, the investigators tested the null hypothesis of no significant difference in the numbers of chargeable accidents and violations during 24 months

following treatment between the control group and each of the treatment processes:

- the court procedure;
- the court procedure plus DRIS;
- receipt of a letter from DPS; and
- receipt of a letter from DPS plus DRIS.

Post-treatment driving records of all drivers participating in the study, whether or not they completed DRIS, showed that both groups had fewer post-treatment offences. Best results were observed for the court-petition group, who also took longer to receive their first ticket after training and, overall, received fewer tickets for violations than the direct-citation group. No significant differences were found among the groups for chargeable accidents. Another analysis compared those drivers who completed DRIS, with the control group, producing similar results. When the results of these two analyses were compared, no statistical differences emerged in post-treatment driver records between drivers who completed DRIS and those who did not. The authors speculate that the impact of the course may be "equivalent to the perceived threat of suspension for non-appearance in the DRIS". They conclude:

> The content of this intervention does not make as much difference as the fact that intervention occurs; and the punitive connotation of the adjudicative process seems to induce better driver performance than just an administrative summons to class. A Driver Improvement course may improve their knowledge, but motivation and attitudes apparently are still influenced more by the perception of law enforcement or judicial surveillance than by educational techniques, at least as imparted by the particular training program used in this demonstration. (p. 58)

Another objective of the demonstration project was to determine the extent to which instructional objectives were achieved for those drivers receiving treatment. Based on pre- and post-treatment tests, results of the 50-question test showed that DRIS participants scored significantly higher on their post-treatment test than on their pre-test; their

post-test scores were significantly higher than the control group. Although decreases in knowledge were evident among DRIS graduates, their test scores remained significantly higher than controls 12 months later.

o Washington. Salzberg et al. (1985) reported results of a pilot project for high-risk drivers in Washington. Multiple offenders were selected and randomly assigned to either the treatment or the control condition. All potential participants were contacted by letter, which indicated that their participation in a driver-improvement interview was required. Drivers who failed to appear had their license suspended and were excluded from the study. Drivers in the control condition (N=276) who appeared for the interview were told the interviewer was ill and were immediately excused. Thus, the control group included only drivers who actually made the effort to show up for the interview. In the Treatment condition (N=285), participants attended a small-group interview.

The general purpose of this interview was to help violators understand that their driving behaviour was deviant compared to the general population and that they posed a risk to themselves and others. Moreover, during this meeting, participants were asked to identify and commit themselves (in writing) to one or two specific goals or courses of action that would lead to an improvement in their driving behaviour. In addition, participants were placed on probation -- further citations within twelve months would result in license suspension.

Driving records 15 months later revealed significantly fewer violations among treatment drivers compared to control-group drivers. The treatment group had 19.9% fewer violations during this period. There was no significant difference in accident rates between the two groups. The sample size was probably too small to provide a reliable assessment of the effects of the program on accident rates.

The goal-setting technique was considered an important component of this program because it allowed participants to receive factual information and to establish realistic goals for future driving. Nevertheless, treatment actually consisted of a number of elements, any one of which

may have been responsible for the subsequent improvement in violation rates. A more detailed evaluation than done would have separated the effects of individual components.

4.2.2 No effects. We found only one study that reported no positive impact of group meetings on driver performance. In fact, this study indicates that an educational course resulted in worse driving records than no treatment.

o Rhode Island. Ulmer (1978) determined whether subsequent accident and violation records of court-designated attendees of a General Education Session (GES) were better than records of a comparison group of drivers. As outlined by Ulmer (1978), the GES course was a one-session, two-hour meeting that included a lecture, film, and film-strip presentation. The course was intended for drivers evidencing a recurring pattern of traffic violations, but not to the extent that would require attendance at the DDC course. Ulmer (1978) reported no significant difference in post-treatment violations between GES and control groups. A reanalysis of data on violations occurring within six months of drivers' assignment dates revealed significant differences between the groups. These differences, however, show a negative effect of the GES course (22 recidivists per 100 GES group members compared to only 15.7 recidivists per 100 control group drivers). With respect to subsequent accidents, no significant differences were found between the two groups overall or within six months of the assignment date. Ulmer (1978) also administered a six-item, multiple-choice pre- and post-test to GES students and found that students who took the post-treatment test answered more items correctly than did students taking the test prior to the course.

In summary, evaluation studies of group meetings that emphasize attitude change have produced mixed results. Generally, these treatments have improved knowledge and decreased the frequency of traffic violations. They appear to have limited effectiveness in reducing traffic accidents. Several California studies indicated that the GEM reduced traffic accidents. Those findings, however, seem to depend greatly on sample

size and on criteria used to measure treatment effects (for example, accident means versus proportions of persons who were accident-free). Given large samples and favourable measurement criteria, it is possible that other treatments would also have been judged effective. Nevertheless, recent studies in California indicated that even the effectiveness of the GEM had declined, which resulted in dropping the group-meeting approach from the negligent-operators program.

The Texas demonstration project (Koppa et al. 1981) indicated that treatment content may be less important than the fact of intervention itself, particularly if contact is with the judicial system. The study by Koppa et al. involved young problem drivers aged 16-25 years. A general "intervention effect" may not be found for older groups of drivers.

4.3 Summary

Although group meetings vary from jurisdiction to jurisdiction, they can be classified as three general types: driver re-education, attitude change, and emotional/motivational. There are substantial differences in the results of studies evaluating effects of group meetings. For example, the Defensive Driving Course has reduced violations, but not accidents. Other driver re-education courses have generally failed to improve driver performance and seem less effective than the DDC in reducing posttreatment violations. Group meetings that emphasize attitude change have been shown to have positive effects on subsequent violations and posttreatment accidents. There is some evidence to suggest that the type of treatment is less important than intervention per se. Notices to attend a treatment, however, often include a threat to suspend the driver's license upon further convictions. The relative effects of these factors -- treatment and/or threat of sanction -- cannot be determined given the design of studies done to date.

5.0 LICENSING ACTIONS: SUSPENSION, REVOCATION AND PROBATION

Previous sections have reviewed driver-improvement treatments involving written warnings, counselling, and education. Typically, warning letters and individual or group meetings represent initial stages in a progression of interventions that culminate in licensing actions against those driver who fail to respond to initial treatments. This section concerns the various punitive actions imposed on problem drivers.

5.1 Background

As we discussed in Section 1.0, the dominant and pervasive philosophy of driver improvement is punitive in nature, resting heavily on the concept of deterrence. Reflecting this philosophy, every jurisdiction in North America employs such sanctions as license suspension and revocation for persons convicted of serious or frequent traffic-law violations. As described by Gilbert et al. (1980, p. 44):

> Suspension is the temporary removal of the driving right/ privilege, and revocation is the permanent lifting of the permission to drive. Although these are the exact meanings, the words are often used interchangeably even in state statutes. Suspension usually refers to a relatively brief period after which the driver license is revalidated. A revocation, however, may be for a period of several years, although usually not a permanent prohibition on driving.

Suspension and revocation of driver licenses provide a means to remove high-risk drivers -- those persons who have been identified as hazardous to themselves and to others -- from the highways. As noted by Kaestner (1974), for example, one of the major objectives of contemporary driver-improvement outlined by the AAMVA (1965) "concerns itself with eliminating from the highways the unsafe, incompetent and physically or mentally unqualified drivers via refusal or withdrawal of driving privileges" (p.7). Applying suspension or revocation as an ultimate sanction reflects the idea that "driving is a privilege rather than a right", it being reasonable to remove unsafe or delinquent drivers from the roads (Robinson 1977).

Using license suspension as a strictly punitive measure, however, has been criticized because "it leaves no real incentive for improvement in driving performance" (Gilbert et al. 1980; English 1977). If the underlying rationale is to improve driving performance, the withdrawal of a driver's license represents a "system failure". Kaestner (1974), for example, makes the following observation:

> The industrial analogy of requiring a man who has had several accidents on the job to stay home 30, 60, or 90 days, thus denying him the opportunity to practice or relearn the skill of his trade, and then return to the job with the expectation that he will somehow have regained a level of competence during this interval of idleness is a reflection of current suspension programs for driver licensing. (p.8, 9)

In light of the above considerations, suspension has also been considered the "teeth" of the driver-improvement process (Weidman et al. 1982a,b). The threat of withdrawal of driving privileges "drives" the system (Staplin and Knoebel 1985) and operates as a deterrent to intentional risk-taking (Ames and Micas 1972). As Weidman et al. (1982a,b) observed, the threat of suspension contributes to the effectiveness of all lower levels of action, for example, warning letters, group meetings, and individual hearings. The withdrawal of license is a last resort when a driver fails to respond to other rehabilitative and therapeutic methods (Cameron 1975).

The effectiveness of both suspension and revocation depends upon the cooperation of the driver (McGuire and Peck 1977a; Gilbert et al. 1980). Several reviews of studies on suspension effects reveal that suspension is not completely effective in deterring suspended drivers from driving (Kaestner and Speight 1975; Li 1980; Gilbert et al. 1980; Robinson 1977). In California, for example, Coppin and Van Oldenbeek (1965) examined the accident and violation records of 1,326 drivers in a six-year period following suspension of their licenses for a first traffic offense. The authors report that 33% of suspended negligent drivers, and 68% of revoked negligent drivers had officially recorded instances of driving while suspended or revoked. As noted by Kaestner and Speight (1974), an even higher estimate of driving while suspended

(52.3%) was obtained from a mailed questionnaire sent to recently reinstated drivers in Oregon.

In a review of these studies and several others (Finkelstein and McGuire 1971; Harrington 1972; Willett 1973), Robinson (1977) concluded that the proportion of drivers who violate the sanction is between 32% and 68%. Robinson (1977) also reported results of a mail survey of 1,552 disqualified drivers in Victoria, Australia; this study indicated that 36.4% of respondents admitted driving while disqualified, and over 40% of these persons drove on 20 or more occasions. As Gilbert et al. (1980, p. 45) discussed:

> It is known that many individuals drive even while their license is suspended or revoked, although the extent of the problem cannot really be known. Usually detection of such driving is discovered only if the driver is stopped for a subsequent violation or crash. The estimates of the number of persons with suspended or revoked licenses who nevertheless drive range up to 80 percent (New York Department of Motor Vehicles, 1975). Kerrick (1974) has estimated that at least ten million unlicensed drivers are on the road on any given day. He includes in this estimate not only those under suspension or revocation but also those with expired licenses and those who cannot qualify for a license. Based on spot checks over a six-month period, Michigan estimated that 60,000 drivers were using the highways without a valid license. This is approximately 1-1/2 per cent of the total number of licensed drivers in Michigan. Again, this figure includes not only those with suspended or revoked licenses but also those with expired licenses or no licenses (Hricko, 1970). In 1968, Montana arrested approximately 1-1/2 percent of their driver population for driving without a valid license or while under suspension or revocation (Hricko, 1970). It is believed that persons whose license has been suspended or revoked may be overrepresented in serious and fatal crashes, but because such drivers may carry additional licenses from states where their driving privilege has not been suspended, it is difficult to determine the extend of such a problem. A recent study on suspended and revoked drivers has estimated that such drivers are involved in 4 to 14 percent of all fatal crashes (NHTSA 1979b).

Based on such results, several investigators have concluded that license suspension lacks effectiveness (Joscelyn 1976; Timberlake 1970; Robinson

1977), and Hricko (1970) has gone so far as to suggest that, under existing systems, license suspension was a paper tiger (Robinson 1977).

In addition to difficulties associated with sanction compliance, Gilbert et al. (1980) observed that:

> courts, and especially juries are reluctant to impose such a severe penalty because of hardship that may result. If a charge carries with it mandatory suspension upon conviction, the charge may be reduced through plea bargaining or, if not reduced, the defendant may be acquitted. (p.47)

This difficulty has been further underscored by Robinson (1977) in citing Rahn (1970), a Municipal Court judge in California, who noted that "judges who have to pass sentence on drive-while-disqualified offenders are placed in a difficult position because of the lack of a suitable educative or rehabilitative penalty". According to Robinson (1977), Rahn recommended the imposition of extended jail sentences only for offenders who repeatedly violate the sanction, and called for research to produce evidence on the types of treatment programs which could rehabilitate problem drivers (p.24). Robinson (1977) noted that Klein and Waller (1970), Stevenson (1970) and Little (1972) have found that both the police and the courts are reluctant to impose sentences of license disqualification because they believe that such a penalty will cause economic hardship for a disqualified driver.

Given problems associated with driver compliance and enforcement, there has emerged a considerable interest in introducing alternative license actions, although suspension remains the ultimate sanction. The typical approach has been to impose limited/hardship or probationary licenses. The terms limited, hardship, probationary, and restricted are often used interchangeably in the literature. Li (1980, pp. 32,33) identified four approaches to such licensing:

> The <u>first</u> and most common (24 states) approach to hardship licensing is to restore the driving privilege upon proof of hardship. Generally, the hardship should be related to employment but seven jurisdictions only

require a showing of general hardship such as driving to receive medical care. The second approach taken is very similar to the first in that restricted driving is authorized to prevent undue hardship. It differs from the first approach in that drivers are not required to show proof of undue hardship. The basis for this approach assumes that hardship will inevitably result from loss of driving privilege, and therefore a limited license with proper restrictions will permit the necessary driving to avoid the hardship. Twelve states, including North Carolina are using the restricted approach to hardship licensing. Third, six states take the professional driver approach to hardship licensing. Hardship is not the central issue here, but rather the approach gives special considerations to the professional (commercial) drivers because of their high mileage exposure. Generally, these jurisdictions allow the professional drivers to retain their licenses without restrictions when such licenses would otherwise be suspended or revoked under the usual point system for passenger car operations. Finally, the last and the most preferred approach to hardship licensing stresses driver rehabilitation. With the rehabilitative approach, drivers must comply with certain conditions (such as attending DUI schools) in order to receive a limited license. This latter approach is preferred over the others because it takes into account the needs of the suspended drivers as well as those of the public at large. In determining eligibility for limited driving privileges, a balance must be struck between the need to rehabilitate the traffic offenders and the need to protect the public. The balance is best achieved by the rehabilitative approach which restores driving privileges only when drivers have taken steps to improve their driving and the type of driving permitted will not create undue risk to the public. Furthermore, single license restoration is not automatic, the approach provides incentives for the offenders to improve their driving. If improvements are not made, such as if the driver is still an active alcohol abuser, then suspension will continue with its accompanying hardship. However, although this approach is encouraged by the Uniform Vehicle Code (Section 11-902.2), only 15 states utilize the rehabilitative approach in granting limited driving privileges.

The fourth approach, described above, would include such probationary licenses as found in California; drivers placed on probation as a "last-chance alternative" to suspension. Drivers who violate during their probation are typically suspended from driving. This kind of

approach has received considerable attention. For example, Li (1980, p. 49) makes the following recommendations for North Carolina:

> For drivers who are in danger of losing their driving privileges, a probationary license program combined with some driver improvement measures such as driver improvement clinics, counselling or treatments for alcohol abuse is recommended as a better alternative to rehabilitate drivers than suspension itself. Suspension is merely a license control action whereas the probationary license program, especially when combined with rehabilitative measures, focuses more on driver improvement. However, for the probationary program to achieve its intended impact, drivers must be provided with incentives to improve their driving. Therefore, it is recommended that suspension be reserved as a threat to deter drivers from violating the conditions of the probation (such as not observing the driving restrictions or dropping out from a treatment program) or incurring driving infractions while holding a probationary license.

Support for a probationary-license program, however, is not unanimous. Gilbert et al. (1980), for example, outline several arguments that have been made against the concept of the limited license:

> First it is pointed out that suspension is indeed intended to be a hardship. If it were not, there would be no incentive to drive safely so as to avoid suspension. This position asserts that a major purpose of suspension is a punitive one. A second argument for suspension and against the limited license is that the major purpose is to remove the unsafe driver from the road. The limited license allows him to continue to drive, thus circumventing the intent of suspension and endangering others. A third argument against the limited license is that the restrictions on it are unenforceable. Of course the same thing may be said about license suspension itself. (p. 49)

Based on such considerations, and in contrast to Li (1980), Weidman et al. (1982b) recommended a full suspension over a restricted license as part of their driver improvement system. They provide the following reasons to support this view:

> Records of drivers on limited suspension show that many accidents and violations occur during the period the drivers were permitted to drive.

> The research data indicating effectiveness of sanctions result from full suspension or revocation. The potential effectiveness of a restricted license, if any exists, is unknown.
>
> One purported advantage of a restricted license is that it would help alleviate hardships imposed by full suspensions. Yet the hardship imposed may well be one of the things that makes full suspension an effective deterrent.
>
> Allowing offenders to drive "with impunity" within the terms of a restricted license may reduce their perception of the need to exercise extreme caution on these occasions.
>
> Trying to enforce a restricted license can be extremely difficult unless the place and time where driving is allowed is clearly specified on the license.
>
> Determining appropriate restrictions and entering them on the license would require additional time, substantially increasing the cost of the action. (p. 33)

Despite these reservations about probation, Weidman et al. (1982a,b) suggest that drivers whose licenses are reinstated following suspension would be placed upon probation and would be eligible for suspension on the next offense.

In summary, there remains some controversy about the relative merits of probation, suspension, and revocation. The section below reviews studies of the effectiveness of licensing actions in reducing traffic accidents and violations. As will be shown, some evidence exists supporting probation as an effective traffic-safety countermeasure. The effectiveness of suspension, however, remains questionable. Even so, there is a consensus that suspension should be retained because it is believed that the threat of its imposition contributes to the overall effectiveness of the driver-improvement process.

5.2 License Suspension

License suspension does not appear very effective in deterring drivers from driving and from committing further violations. As observed by Weidman et al. (1982a), however, "at a minimum, it may induce offenders

to drive less frequently and somewhat more cautiously". There is some evidence that this may be the case. For example, Hagen et al. (1980) reported that among suspended and revoked drivers convicted of drinking-driving offenses who admitted to driving (32% and 61%, respectively), 65% reported they had reduced their driving, and more than half said they drove more carefully while under sanction. Given these findings, one would expect that suspended drivers would evidence an improved safety record following sanction. A review of evaluation studies by Williams et al. (1984) confirms this expectation. They observed that the only traffic-safety countermeasure evidencing statistically significant reduction of subsequent accident and conviction frequency among multiple DUI offenders (persons arrested and convicted of drunk driving) has been the mandatory imposition of a license suspension or revocation.

> The California studies using rigorous evaluative procedures have demonstrated that the mandatory application of a license suspension (12 months) or revocation (36 months) in conjunction with fines and/or jail sentences evidences more traffic safety impact than the singular use of fines and/or jail sentences or the alternative use of a 12-month alcohol abuse treatment program [Epperson et al., 1975; Hagen, 1978; Hagen et al., 1979]. In general, multiple DUI offenders receiving the licensing actions in addition to fines and/or jail sentences evidenced at least 30% fewer accidents and convictions than similar drivers receiving only fines and/or jail sentences. The treatment effect associated with licensing action lasted approximately 42 months on DUI recidivism and 48 months on subsequent accident involvement. Further, multiple offenders receiving the mandated actions as opposed to participating in a 12-month program for alcohol abuse generally evidenced 30% fewer convictions and accidents while under licensing action than drivers participating in the treatment program. Reduced driving exposure was suggested as the principal component of the treatment effect associated with the licensing actions. (Williams et al. 1984, p. 333)

While license suspension or revocation appear effective as accident-reduction countermeasures for impaired-driving offenders, the overall effect of suspension or revocation on habitual or multiple offenders is questionable. For example, studies in North Carolina and Oregon have produced contradictory results.

Li and Waller (1976) evaluated the mandatory revocation for habitual offenders (HO) in North Carolina and found no significant differences in subsequent driving records for the HO license-revocation group and the control group (drivers who were facing HO prosecution but still retained their driving privileges). As observed by Li and Waller (1976), the HO statute was subsequently repealed in North Carolina because of questions about its effectiveness.

In contrast to findings in North Carolina, Kaestner and Hawes (1977) report that the Oregon Habitual Offender (HO) law was effective in reducing subsequent serious traffic accidents among revoked drivers in comparison to two control groups (pending court prosecution and Defense Attorney returned cases). The authors speculated that discrepancies between the two studies may be partly due to the warning letter provision in the Oregon HO program. They note that "drivers who were one violation short of the HO status were sent a warning letter that was associated with a greater delay in the commitment of a subsequent major violation, therefore, deferring HO status and license revocation" (Kaestner and Hawes 1977; Li 1980).

Although revocation for habitual offenders appeared effective in Oregon, an earlier investigation suggested that license suspension is an ineffective accident- and conviction-reduction measure. Kaestner and Speight (1974, 1975) randomly assigned 960 drivers eligible for first-time license suspension into five groups: suspension (208); warning letter (206); probationary license (222); defensive driving course (97); and control (199). The intent of the study was to evaluate the effectiveness of suspension relative to these other alternatives. The authors found that license suspension was <u>not</u> effective either in reducing the number of drivers who have moving violations or culpable accidents or in delaying the time to first traffic entry. Despite the apparent lack of effectiveness of license suspension, Kaestner and Speight (1974, 1975) did <u>not</u> recommend discontinuation of the suspension program. They contended that the effectiveness of other treatments depended upon the existence of suspension as an alternative and, therefore, concluded that "outright suspension of driving privileges [should]

remain as the ultimate weapon to combat the effects of negligent driving".

In contrast to the lack of effectiveness of license suspension, a one-month probationary license that allowed drivers to establish their own driving limitations (i.e., hours of the day and days of the week) significantly reduced the number of driver failures and increased the delay time to subsequent failure. Given these findings, Kaestner and Speight (1974, 1975) recommended that "more extensive use of a probationary license as a driver improvement device should be considered".

In summary, evaluations of the effectiveness of license suspension/revocation have produced mixed results. Suspension/ revocation appear effective when imposed on drinking-driving offenders, but this licensing action does not always deter multiple violators from driving and incurring subsequent accidents and convictions. These differential treatment effects by offender type may be due to the willingness of drinking-driving offenders to accept that impaired driving represents unlawful, and perhaps more importantly, unsafe activity. In contrast, drivers convicted of offenses like speeding may view such behaviour as "unlawful", but not necessarily hazardous. Thus, drinking-driving offenders may be more likely to comply with a "deserved" license sanction than other offenders, who may feel unjustly treated. These observations, however, are entirely speculative. Kaestner and Speight (1974, 1975) suggested that probation may be an effective alternative to the withdrawal of full-driving privileges. Other evaluations of the effectiveness of probation are reviewed in the following section.

5.3 Probation

Li (1980) reviewed a study by Johns and Pascarella (1971) evaluating a North Carolina law granting limited driving licenses to first-time alcohol offenders. The investigation compared three groups: limited license group; revoked license group; and a general-population group. Limited-license drivers were found to have more convictions and crashes than revoked drivers but no more crashes than drivers in the general

population. Since the investigation does not include a "true" control group, it is not possible to draw conclusions about the overall effectiveness of either the limited or the revoked license.

In California, probation has been employed as a last-chance alternative to license suspension. As described by Peck and Kadell (1983), drivers who violated following a Group Educational Meeting were required to attend an individual hearing where some form of restrictive action was taken against the driver, usually a one-year probation. Drivers who violated during the period of probation were required to attend a probation-violator hearing, which often resulted in a suspended or revoked license. As discussed in Section 3.0, both the individual hearing and the probation-violator hearing along with associated licensing actions were shown to reduce conviction and accident frequencies significantly compared to no-contact control groups (Peck and Kadell 1983). The probation hearing (standard one-year probation and a group hearing) of the new negligent-operator program in California has also been shown to reduce traffic citations (Marsh and Kadell 1985).

Several studies in California examined other alternatives to granting probationary licenses. For example, Garretson and Peck (1979) examined effects of not taking action (probation, suspension) against negligent operators subsequent to individual hearings. Negligent operators who reported for their scheduled hearing were randomly assigned to either the standard treatment (N=2646) in which licensing action was taken, or the "no action" treatment condition (N=2589). Drivers judged to be inappropriate candidates for the "no action" treatment were eliminated from the two experimental groups.

Effects of the "no action" treatment were determined by review of subsequent 12-month driving records. The standard and "no action" groups did not differ at follow-up in terms of total accidents, fatal/injury crashes, or number of moving violations. This indicated that placing a driver on probation following an individual hearing had no greater beneficial effect than taking no action at all. The results also indicated that individual hearings for negligent operators resulting in no licensing action have no overall detrimental effects on

subsequent accidents and convictions. The annual financial savings from a "no action" program was estimated to be about $173,000.

Sherman and Ratz (1979) reported an evaluation of probations-by-mail as an alternative to the standard individual hearing for negligent operators. Post-treatment driver records of probations-by-mail and individual-hearing groups showed no difference in accidents, but the former group tended to have slightly more convictions. The authors recommended the probations-by-mail program as an alternative to the individual-hearing program because "the accident reduction potential is the same and yet the former is a simpler and less costly (savings amounting to $379,000) alternative to implement".

Prior to 1981, California drivers who violated the 12-month probationary period after an individual hearing (i.e., received a traffic conviction) were either issued a warning letter, extended probation, or were scheduled for a probation-violator (PV) hearing. Typically, PV hearings resulted in a license suspension (3-6 months) or revocation for one year. Based on the premise that "the present PV hearing and PV licensing actions have not resulted in the desired degree of accident reduction", Williams and Hagen (1981) report on a project intended to maximize the impact of the probationary process on driving performance. The study design was based on the following concepts:

- Negligent operators expect to lose the driving privilege if they violate probation. A negotiated license restriction offers the driver a desirable alternative to loss of the driving privilege.

- License restrictions may be designed to meet transportation needs expressed by the driver, while also controlling and eliminating unsafe driving. Thus, the legitimate traffic safety responsibilities of the department and the driver may be met without removing the driving privilege altogether.

- A negotiated contingency contract is the preferred means of describing licensing sanctions, conditions of probation, and the respective obligations of the department and the probation violator. The process of signing the contract serves to formalize the driver's commitment to behavior change.

- Case assignment allows the DIA to develop in-depth knowledge of probation violators with whom repeated hearings are conducted. Secondly, in-depth knowledge could result in more appropriate actions after a hearing, thereby producing changes in driver behavior leading to decreased traffic accident involvement.

- Case assignment fosters increased mutual knowledge and rapport between the driver and the DIA.

- Periodic performance review and follow-up contacts between the DIA and the probationary driver provide the driver with the reinforcement required to shape and maintain responsible driving behavior.

- Case monitoring provides DIAs with feedback on the outcome of their driver improvement activities.

- Making the avoidance of responsible accidents an explicit condition of probation will serve to emphasize the true traffic safety goal of the PV hearing. (pp. 9,10)

Drivers who qualified for a probation hearing were assigned either to a standard hearing group (i.e., a 30-minute, one-on-one meeting with a DIA, which typically resulted in suspension or revocation) or to one of two new hearing formats that made use of driving restrictions negotiated with the driver in the form of a contingency contract (mutually acceptable probation agreement). As outlined by Williams and Hagen (1981, p. 17):

- The fixed restriction hearing made use of a restricted driving privilege during the first 2-4 months from project entry. Only necessary driving, or minimal risk exposure was allowed during this time. Unrestricted driving was allowed during months 5-12.

- The sequential restriction hearing made use of three stages of restricted driving privilege during the 12-month probation period. During Stage I (usually months 1-4), only necessary driving, or minimal risk exposure was allowed. During Stage II (usually months 5-8), some recreational driving, or moderate risk exposure was allowed. Finally, Stage III (months 9-12) allowed unrestricted driving.

Unlike the standard hearing, the fixed and sequential restriction formats included systematic follow-up contacts at the end of each restriction stage and upon successful completion of probation.

Post-treatment driver records showed that the standard-hearing format had lower fatal and injury accident means than the two new treatments. There was no significant difference between hearing formats on property-damage accidents. With respect to conviction experience, the standard-hearing format had the lowest, but not significantly different, means for both two-point and one-point convictions. The fixed-restriction-format group, however, had significantly fewer zero-point conviction means than the other two hearing groups.

Survival curves for the three groups revealed that the standard-hearing group performed significantly better in delaying accident failure than the sequential-restriction group, particularly during the initial 1-4 months and the 9-12 month period. The survival pattern for convictions demonstrated no difference in traffic-safety impact among the three groups. Williams and Hagen (1981) concluded that the new treatments based upon behaviour-modification principles appeared less effective than conventional punitive sanctions.

Based on their findings, Williams and Hagen (1981) recommended that the Department of Motor Vehicles should continue to conduct probation-violator hearings, using optional license restriction, but should not use the fixed-restriction hearing or the sequential-restriction hearings.

In summary, available evidence generally indicates positive effects of probation. A series of studies in California, however, suggest that the effects of probation may result more from the intervention per se than the content of the treatment. For example, Garreston and Peck (1979) showed that removal of departmental actions (typically probation) from the individual hearing had no detrimental effects on subsequent accidents and convictions. Sherman and Ratz (1979) also found that there was no significant driver-record differences between probations-by-mail

and the individual hearing with associated licensing action. The lack of differences between treatments suggests that the intervention itself (i.e., some form of contact with the negligent operator) may be more important than its actual content. With respect to the probation-violator hearing, however, Williams and Hagen (1981) did find that the format of the standard hearing was preferable to that of new treatment formats that involved negotiation of a mutually acceptable probation agreement between the probation violator and the DIA.

5.4 Summary

Licensing actions against traffic offenders are taken in every North American jurisdiction. The underlying rationale for punitive actions varies. Several jurisdictions impose sanctions primarily as a means to remove high-risk drivers and serious traffic offenders from the highways. In other jurisdictions, sanctions represent the "teeth" of a driver-improvement process. The threat of licensing actions is believed to improve the overall effectiveness of lower-level, less punitive treatments. In most instances, actual restrictions or withdrawal of driving privileges are done only as a last resort.

The effectiveness of various licensing actions remains in question. For example, license suspension and revocation tend to improve the driving performance of drinking-driving offenders but not necessarily that of multiple traffic violators. Moreover, studies have consistently found that substantial numbers of drivers still operate motor vehicles after their licenses have been suspended. Evidence of the effects of probation is more consistent and generally positive. These findings support, to some extent, the notion that the threat of license suspension may deter many drivers from incurring further traffic violations and accidents.

6.0 NONPUNITIVE APPROACHES TO DRIVER IMPROVEMENT: REWARDS, INCENTIVES, AND REINFORCERS

This section concerns nonpunitive approaches to driver improvement. As the title suggests, three terms -- rewards, incentives, and reinforcers -- would appear to offer a natural way to organize the review of literature on alternatives to approaches based on threats and punishment. The terms have strict meanings with clear distinctions based on psychological theories from which they were derived. Unfortunately, as discussed in greater detail below, conceptual differences among these terms largely disappear in the driver-improvement literature, where they are often interchanged or used inappropriately. This "problem of organization", however, points to a pervasive issue in the whole area of driver improvement, that is, the uncertain (and often uneasy) relationship between theory and practice. Thus, the following subsection deals with this issue in the more general context of nonpunitive approaches. The next subsection reviews several recent studies that have applied and tested nonpunitive approaches. As the summary to this section will indicate, it is virtually impossible to impose a greater conceptual order on the findings of these studies.

6.1 Nonpunitive Approaches: Relationship Between Theory and Practice

Psychologists have often recommended nonpunitive strategies and tactics to supplement virtually complete reliance on criminal or administrative penalties for violations and accidents (e.g., Miller and Dimling 1969; Kleinknecht 1969; Ames and Micas 1972; Murdoch and Wilde 1980; Wilde and Murdoch 1981). Theoretical support for these recommendations derives from the work of Skinner (1953), Wolpe et al. (1964), Bandura (1969), Wilde (1975, 1976) and, no doubt, others. To review theories and concepts underpinning the use of rewards, incentives, and reinforcers in driver improvement lies beyond the scope of this study. Moreover, and more importantly, the literature indicates that such a task would not prove useful as an introduction to the topic at hand.

Most theories referenced in the literature on driver improvement have been developed and applied in experimental or clinical settings far

removed from traffic safety. An exception might be the Theory of Risk Homeostasis, which Wilde has widely propounded in road-safety circles (see Wilde 1982; Wilde et al. 1985). Traffic safety itself is an eclectic, highly applied field with multiple disciplines, not the least of which is psychology. The transference of psychological theory to such operational settings as driver licensing agencies is problematic, to say the least. Clearly defined terminology can become imprecise, imbued more with practical understanding than with theoretical rigor. For example, the notion that negative reinforcement (from operant conditioning) implies disagreeable or adverse treatments is common. Strict use of the term in operant conditioning, however, carries no such connotation: a negative reinforcer is merely a stimulus (no value judgment attached) which, upon removal, increases the likelihood or frequency of a behaviour preceding its removal.

Often, negative reinforcement is incorrectly equated with punishment. But, the two are very different. Negative reinforcers actually increase the frequency of the behaviour in question; punishers decrease or suppress its frequency. Likewise, "reward" and "incentive" have no meaning in operant conditioning; these terms do have meaning in other theories, for example, those of cognitive psychology, which employ constructs of attitude and motivation, and those of instrumental learning. Rewards or incentives, which imply value judgments, may be positive reinforcers if, when applied as operationally defined stimuli, they increase the likelihood of the preceding behaviour. Even the common parlance, however, can mislead. A condition or act may be considered "positive" in the sense of appreciated (reward) or desirable (incentive). Unless assumptions to this effect are validated for groups of individuals so treated, the descriptors reward and incentives remain convenient labels for value judgments (usually) on the part of the treatment agency as to how recipients should perceive the treatment and how recipients should respond. The confounding of "theoretical" perspectives and the confusion of different terms seem very prevalent in the literature on driver improvement, not least among psychologist/reviewers who know better (e.g., Murdoch and Wilde 1980, pp 48-69).

Nevertheless, the major dilemma posed by the literature under review is one of substance, not semantics: how to understand and interpret results of studies that employed "rewards" or "incentives" to decrease violations and accidents among problem drivers. The dilemma stems from the loose blend of scientific research and operational measures so characteristic of traffic safety. In the area of driver improvement, psychological theories appear to provide little more than plausible conceptual frameworks or face-valid justifications for the development and implementation of programs. The programs are not intended as tests of theory, but rather as cost-effective means of achieving the very practical objectives of licensing agencies. Rigorous experimental designs and sophisticated statistical methods of data analysis complete the scientific trappings of programs. Nonetheless, the primary emphasis remains whether or not the program worked. A favourable cost-benefit analysis gives rise to no questions about how or why the program was effective; a programmatic failure, however, spurs post hoc speculation, because the program was not designed to address theory-based hypotheses nor to test the validity of causal assumptions linking program activities and ultimate outcomes.

The tension between theory and practice is thematic in the driver-improvement literature, especially that concerned with rewards and incentives. Many programs and evaluation studies seem driven by theory, or at least some implicit model of human behavior. Many other programs are apparently adopted simply because they are believed to work. To understand how theoretical requirements and practical considerations sometimes conflict, we can recall that the general driving public is extremely heterogeneous. For example, there are many identifiable groups in such categories as "clean drivers" (no violation); "soiled drivers" (one or two minor violations); and "dirty drivers" (multiple or major violations) (Waller, Hall, and Padgett 1977). It seems extremely unlikely that any one technique or tactic will successfully encourage safe driving performance for all types of drivers and their various problems with driving. At the same time, there are hundreds of theories relevant to human behaviour, and dozens concerned with the control of human behaviour (e.g., learning theories). Some driver-improvement

programs are explicitly based on certain theories of human learning (e.g, Kleinknecht 1969). Others result from the pragmatic stance of "something must be done, theory be dammed, everybody knows what works". Both approaches have advantages and disadvantages. For example, one can appreciate that agencies responsible for traffic safety in general, and driver licensing and improvement in particular, do not put forward theories for approval by governmental decision-makers and politicians -- they make the case for programs based on the known state of the art and their potential for achieving bottom-line objectives.

The important point here is that the literature under review is a peculiar mix of theory and speculation. No one theory dominates the field of driver improvement; some theories of learning are often "misused and abused". Thus, it is not possible to organize the results of past studies in terms of applied theory and thus produce a coherent set of conclusions. The practical implications of most evaluation research may be clear in terms of what seems to work, but one cannot expect to find unequivocal and consistent explanations for findings based on models of human behaviour. The alternatives seem obvious:

1. Adopt a model or theory of human behaviour; apply it appropriately and consistently; test the validity of assumptions inherent in programs based on the model; and carefully evaluate the effects. One can thus discover not only the extent to which the program worked, but also how and why, questions that can only be answered with reference to a theoretical framework of thought.

2. Adopt what seems effective, either based on evaluation research conducted in other jurisdictions or based on intuitive beliefs about the control of human behaviour; implement programs consistent with this approach; carefully evaluate the results. One will discover at least the extent to which a desirable impact was achieved, but probably not how or why. The latter questions may be of interest, but not considered worth the cost of inquiry.

The literature on rewards, incentives, and reinforcers in driver improvement features frequent attempts to follow both approaches at once. This helps explain contradictory findings, speculative discussions, and

the lack of practical guidance to decision-makers. It may be only somewhat overstated to conclude that the best advice to operational agencies is "try it out, evaluate it, and see if it worked".

6.2 Nonpunitive Approaches in Practice

Several comprehensive reviews of driver-improvement literature (McGuire et al. 1976a,b; Marcus 1979; Li 1980) have summarized findings of studies that employed "incentives" or "rewards" prior to 1980. For the most part, however, such studies were grouped with others according to operational or programmatic categories (e.g., renewal testing, warning letters, group meetings, etc.). Murdoch and Wilde (1980) based their review of driver-control literature on Wilde's theory of "risk compensation". One tactic indicated by that theory -- increase the perceived utility of safe-driving behaviour -- related directly to rewards and incentives for accident-free and violation-free driving. They departed from that framework occasionally, however, to discuss topics in terms of operant conditioning, in which, as noted above, rewards and incentives have no place as definitional terms. Nevertheless, their review provides an adequate starting point for the present review.

First, however, we might re-review Kleinknecht (1969), the earliest study to apply behaviour-modification principles to driver improvement. This study was not covered by Murdoch and Wilde (1980) and, moreover, it has relevance to more recent work by Williams and Hagen (1981) as reviewed later in this section. Subjects for Kleinknecht's study were male drivers between the ages of 18 and 35; driving record criteria for selection included two years of driving experience; five or more convictions in 24 months or four convictions and one accident in 24 months; or at least one conviction during a previously imposed probation period. An experimental group was first restricted to driving between 6 AM and 6 PM, Monday through Friday. Every two weeks an additional block of driving time was allowed as a negative reinforcer, contingent on not receiving a citation and not being involved in an accident. Violations of the conditions resulted in suspension of all driving or starting over

with the initial restriction. Three control groups were employed: 1) a non-contingent reinforcement group; 2) a group assembled for a single meeting and not contacted again; 3) a comparison group subject to regular procedures. The four groups did not differ on any of the following dependent variables after the third month of the nine-month study: number of subjects with citation or accident; mean number of record entries for each group; mean time between program start-up and first record entry. Comparing the experimental group to the "manipulated" control groups, Kleinknecht did find significant differences. The experimental group had (1) a greater mean time to first record entry for each of the first three months; and (2) a fewer number of entries during the first month of the program. These findings indicated that, compared to the two manipulated control groups, experimental control was successfully established over the experimental group. Unfortunately, termination of the contingent reinforcements was associated with loss of control, evidencing a lack of "natural reinforcing consequences for safe driving after the program". The study by Kleinknecht, evidently the first to test behaviour-modification principles in a driver-improvement program, is important in two respects. First, it demonstrated the possibility of designing programs of this kind; second, it illustrated that "research designed to systematically delineate the relevant variables operating in driving behaviour is an essential and necessary step that must be taken before the behaviour can be fully understood and changed" (Kleinknecht 1969, pp. 16-17).

Murdoch and Wilde (1980) reviewed several studies that employed rewards and incentives for violation-free and accident-free driving. They also marshalled evidence from areas outside traffic safety to support the contention that nonpunitive approaches at least warrant consideration in the area of driver improvement. In their detailed summary and analysis of driver-improvement studies, Murdoch and Wilde (1980) illustrated the problems of explanation and interpretation inherent in the research and evaluation literature. Many and varied explanations are possible, depending on one's theoretical perspective and one's assumptions about the interaction of treatment and driver characteristics. Based on their

analysis, which was summarized in Table V, p.92 of their report, Murdoch and Wilde concluded the following:

> ... some of the procedures employed in these studies were effective in reducing subsequent accidents and/or convictions of the drivers involved. In the studies under review, incentive procedures were found to be superior to reward procedures in terms of producing the desired result. The number of years that drivers are accident- and/or conviction-free prior to the introduction of an incentive program does influence the eventual effectiveness of the treatment. The literature indicates on the one hand that drivers with previous accidents and convictions respond favourably to incentives by reducing their subsequent accidents compared to control groups (Marsh 1978; Harano and Hubert 1974). On the other hand, drivers who are one or more years accident- and conviction-free have yet to be exposed to a true incentive procedure. Since these drivers are already "good" drivers, it has been thought that a reward procedure would be appropriate, considering their records. However, the studies show that when a reward procedure is employed with drivers who have "good" driving records, the result is either no effect or an increase in the subsequent accident rates for these drivers. (pp. 66-67)

The mixed results of the studies reviewed and the difficulty in explaining them are reflected in additional comments by Murdoch and Wilde in their summary and conclusions (pp. 66-69):

> Temporal factors related to immediacy of reinforcement can greatly enhance the results of an incentive program. This is evidenced by the 22% reduction in subsequent collisions for drivers whose renewal date followed relatively shortly after the announcement of the incentive (Harano and Hubert, 1974).
>
> The type of incentive and its value (e.g., free license renewal, point reduction, test waivers, etc.) cannot be distinguished in terms of eventual impact on subsequent accident and conviction rates at the present time. More research is needed.
>
> Clearly, incentives for road safety can increase the perceived utility of safe behaviour. Use of an incentive contingency may serve the purpose of strengthening existing deterrence countermeasures if an accident and violation-free record is established as a necessary condition for receiving the incentive.

> Problems similar to the exposure to punishment effect with deterrence measures may be overcome in terms of incentives by instituting variable interval schedules of incentive payment or lottery plans. These would serve to maintain the desirability of receiving any given incentive. The literature reveals that there is a problem of maintaining the achievement motivation of drivers involved in incentive programmes.

The quotes above may seem equivocal and contradictory, but they adequately characterize the state of knowledge. Murdoch and Wilde (1980) went on to recommend a pilot project in Ontario "in which administrative incentives are offered to drivers for accident- and violation-free driving over a specified time" (p. 68).

The literature reviewed by Murdoch and Wilde (1980) and others showed a mix of theoretical and practical concerns. Empirical tests of programs using incentive or reward schemes were often combined with procedures that, if effective (or at least not counterproductive), would reduce costs of driver licensing and driver improvement. Waivers of renewal tests and home self-test programs are examples (Harano and Hubert 1974; Waller, Hall, and Padget 1977; Harrington and Ratz 1978). Four more recent studies reviewed below reinforce this theme. Not surprisingly, each proceeds from the California Department of Motor Vehicles, whose continued search for innovative, cost-beneficial programs in the area of driver licensing and improvement can only be described in superlatives.

For many years, drivers in California were required to appear in person at a local office every four years to re-qualify for a license by passing written and vision-screening tests. About four million drivers every year went through this renewal process. In an attempt to curb escalating administrative costs, the California Driver's Licence Extension Study (Kelsey and Janke 1983) was launched to examine the traffic-safety impact of allowing clean-record drivers the opportunity to renew licenses by mail.

Two questions were of primary interest. First, would the mail-in renewal procedure have a negative impact on the number of accidents and violations? Second, what is the expected magnitude of administrative

savings that would result from this type of renewal procedure? A group of 407,000 drivers with no accidents or convictions over the preceding four years were randomly assigned to one of two groups. Of the drivers qualifying, 90% were offered the opportunity to renew licenses by mail for an additional four-year period; the other 10% were required to appear in person at a motor-vehicles office for renewal in the standard fashion.

The first evaluation of the traffic-safety impact of this extension-by-mail program occurred eighteen months after its introduction. In terms of total accidents and convictions, there was no significant difference between groups of drivers who renewed licenses by mail and who renewed them in person. About 3% of the total sample was inadvertently selected as having a clean record whereas, in fact, later updates of their records indicated that they had been involved in an accident or received a citation just prior to being selected for the program. These drivers had significantly worse accident and conviction records than true clean-record drivers regardless of method of renewal. Drivers under 30 years of age in the extension-by-mail group were found to have significantly more convictions than drivers under 30 who renewed in the conventional manner. This difference was not found at the 28-month follow-up.

The potential savings in administrative costs by extending this program to all eligible drivers in the state was estimated to be about $3 million per year. At this interim phase in the program no indication was given as to whether the potential administrative savings might be offset by increased costs due to accidents.

A subsequent evaluation of the Driver's License Extension Study was conducted at the end of four years (Kelsey, Janke, Peck, and Ratz 1985). Overall, the extension-by-mail group was involved in slightly more accidents than the control group. The mean difference in accident rates between groups was 13 crashes per 10,000 drivers. Males and younger drivers had higher accident rates regardless of treatment group. On the other hand, drivers in the extension-by-mail group had slightly <u>fewer</u>

violations than control group drivers over the four-year follow-up period. Once again, younger male drivers received the greatest number of traffic citations regardless of the method of renewal.

Allowing clean-record drivers the opportunity to renew licenses by mail resulted in a net increase over the 4-year period of 13 accidents per 10,000 drivers compared to the conventional renewal process. The net decrease in traffic convictions as a result of the extension by mail program was 29 convictions per 10,000 drivers. Although the authors had intended to perform a cost-benefit analysis of the mail-extension program, uncertainties in the average cost of an accident and the calculation of dollar values associated with public convenience precluded such an analysis. The administrative savings alone, however, were estimated to be about $3 million annually.

In summary, the license renewal by mail program was directed at clean-record drivers as a means to reduce administrative costs associated with in-person license renewals. This study had little difficulty attaining this objective. The impact of this reward for safe driving was minimal. Only 68% of those eligible actually took advantage of the opportunity to renew their licences by mail. Moreover, the reward had no significant effect on subsequent accidents and violations. Although directed at clean-record drivers, the sample inadvertently included drivers who had actually received a traffic citation or were just involved in an accident that did not appear on their records until after the beginning of the program. These drivers had significantly worse subsequent accident and conviction records than clean-record drivers regardless of the method of license renewal. This finding suggests that license extension by mail is unlikely to prove more beneficial for poor drivers than for clean-record drivers.

Since the introduction of the 55 miles-per-hour speed law (MSL) in the United States in 1974, a variety of approaches has been employed to increase compliance with the law. In 1981, the California Department of Motor Vehicles instituted a pilot countermeasure program for motorists with multiple 55 MSL convictions (Kadell 1984). This program, called

the Home Instruction/Point Reduction Incentive (HI/PRI), incorporated both an educational component -- providing information about the traffic safety and energy-saving advantages of 55 MSL -- and an incentive component -- the "masking" of a traffic-violation point for successful completion of the educational component and an accident- and conviction-free record for a six-month period.

The evaluation of the HI/PRI had two components -- a Speed Component, targeting multiple 55 MSL violators and a Negligent Operator Component, applied to drivers with multiple violations regardless of whether 55 MSL was involved. To be eligible for the Speed Component, drivers had to have at least two 55 MSL violations in one year. Eligible drivers were randomly assigned to the HI/PRI group or an untreated comparison group. Each group included about 12,000 drivers. Drivers in the Speed HI/PRI group were mailed educational materials along with an explanatory letter and instructions for completing and returning the "homework" materials. The control group was not contacted.

The Negligent Drivers Component involved four groups. Eligibility was determined by the accumulation of either 4 violation points in one year, 6 in two years, or 8 in three years. A total of 19,600 identified drivers were randomly assigned to one of four groups. The Negligent Operator HI/PRI subjects were mailed educational materials similar to those provided to the Speed HI/PRI group described above, the only difference being the addition of several test items dealing with general traffic-safety issues. Subjects completing and returning the materials were eligible for the "masking" of one violation point provided they maintained a clean record for the next six months. Another group of drivers attended a mandatory Group Educational Meeting (GEM). In this 1½ hour session a wide variety of safety topics were discussed, but not 55 MSL. A variation of the GEM was introduced to isolate possible effects of 55 MSL content. This Speed Educational Meeting (SEM) was identical to the GEM except for the use of educational materials that focussed on 55 MSL. A comparison groups was not contacted.

Response rates for returning the "homework" assignment in both the Negligent Operator HI/PRI and Speed HI/PRI groups were about the same

(45.5% and 47.6%, respectively). Of subjects in the Negligent Operator HI/PRI groups, 24% qualified for violation point masking whereas 35% of the Speed HI/PRI group qualified.

The impact of both components in terms of accidents and convictions were examined 12-months following mailing of materials. In the Negligent Operator Component, subjects in all three treatment conditions (GEM, SEM or HI/PRI) were involved in significantly fewer accidents than comparison group subjects. No one treatment appeared superior to the others in terms of subsequent crash rates. Compared to the control group, each treatment group had fewer convictions. GEM and SEM did not differ from each other but when data for these groups were combined, this treatment was significantly better than HI/PRI. The SEM had the greatest impact in terms of reducing subsequent convictions for 55 MSL.

In the Speed Component, driver records 12-months later revealed no significant improvement in accident rates of subjects in HI/PRI versus comparison subjects. The HI/PRI group had significantly fewer convictions than the comparison group, the difference being about 4%. Further analysis revealed this effect to be greatest among drivers with the greatest number of prior 55 MSL convictions.

Inclusion of the incentive (i.e., masking of violation points) was intended to encourage drivers to complete the homework and to adopt safe-driving practices over the following 6-month interval. The masking of points would be a reward for these behaviours. It would be expected that the effect of the incentive/reward would be greatest among drivers who returned the homework since this was the first condition to be met in earning the reward. Less than half of the subjects actually bothered to return the assignment. Contrary to expectation, a retrospective analysis of homework returnees and non-returnees indicated that the difference in accident rates was slightly in favour of the non-returnees. Hence, it can be safely concluded that the role of incentive/reinforcement in explaining the results is negligible.

A cost-benefit analysis revealed that the Negligent Operator HI/PRI would provide a net savings of $5.4 million per year. This figure

reflects the cost of the program as well as the savings from reduced accidents. The Speed HI/PRI would provide a net saving of $1.6 million annually.

As discussed in some detail in the section on licensing actions (Section 5.0), Williams and Hagen (1981) compared two different probation-violator hearings based on principles of behaviour modification with the standard hearing currently in use in California. Of interest here, of course, is the extent to which negative reinforcement (removal of driving restrictions) increased the likelihood of safe-driving performance. Williams and Hagen reviewed the study by Kleinknecht (1969, see discussion above) and criticized it on two counts:

1. Kleinknecht made no attempt to customize restrictions to the needs of the drivers and, further, the restrictions were not negotiated. Williams and Hagen cite Kazdin's (1975) contention that "contingency contracting" is a "very effective method of establishing the mutual responsibilities and benefits to be received by two or more parties". (p.5).

2. Kleinknecht employed too short a follow-up period and had a small sample size; as a result, there was low statistical power in detecting an impact on the number of accidents.

Based on the method of contingency contracting, therefore, the new probation-violator hearings employed either (1) "fixed restrictions" (a restricted driving privilege during the first 2-4 months from project entry, then unrestricted driving during months 5-12); or (2) "sequential restrictions" (months 1-4, necessary driving only; months 5-8, some recreational driving, too; months 9-12, unrestricted driving). Moreover, a longer follow-up period and a much greater sample size than used by Kleinhnecht were features of the experimental design.

Williams and Hagen (1981) also incorporated certain "case management techniques...to maximize and preserve both knowledge of drivers and rapport with drivers gained through face-to-face contacts". These techniques are: case assignment of probationary drivers to a specific DIA [driver improvement analyst], systematic monitoring of driver

performance by the assigned DIA, and periodic communication and feedback on performance between the DIA and the driver during the period of probation subsequent to a hearing" (p.9). As Williams and Hagen state at the outset of their report, "since the purpose of the present project was to maximize the impact of the probationary process on driving performance, rather than to separately measure the relative contributions of contingency contracting or caseload management, we chose to adopt and integrate both techniques" (p. 9). This choice once again demonstrates that operational concerns take precedence over questions relevant to the theoretical basis of driver-improvement actions. In any event, the purpose and design of the project preclude any meaningful discussion of the effectiveness of strategies based on principles of behaviour modification. Because of this situation, the comment by Williams and Hagen that results of the project "failed to demonstrate the applicability of such strategies with probation violators" (p. 72) was inappropriate, since the project cannot be considered a fair and direct test of those strategies. Much of their ensuing speculation concerning why the two hearings were not more effective than the standard hearing would have been obviated by special follow-up studies of the subjects of the project -- for example, whether "some drivers may not have 'bought into' the contracting process" and thus "would have had little incentive to improve their driving" (p. 73). Not only were the two new hearing designs not as effective as the standard hearing, but also the project contributed little to the advancement of knowledge in this area.

6.3 Summary

Psychological theories predict more lasting benefits from strategies and tactics employing rewards, incentives, and reinforcers than those resulting from punitive action (see Miller and Dimling 1969). Applying theoretical principles in operational contexts like driver licensing and improvement has been difficult. First, no one theory or conceptual framework guides the practice of driver improvement. Second, there is persistent confusion over the meaning of such terms as negative reinforcement, which does not mean punishment. Third, psychological

theories may provide plausible bases for the design and implementation of driver-improvement programs, but evaluation studies rarely gather data to test the validity of implicit assumptions.

As a consequence, the literature on rewards and incentives in driver improvement exhibits a loose mix of theory and post hoc speculation. Contradictory (and unexpected) findings of evaluation studies do not offer clear directions for the development of nonpunitive approaches to driver improvement. Nonetheless, the possibility that nonpunitive programs can improve driving performance among some subgroups of drivers remains.

PART THREE

SYSTEMATIC APPROACHES TO DRIVER IMPROVEMENT

7.0 DRIVER IMPROVEMENT AS A "SYSTEMS" PROBLEM

Section 1.0 introduced and discussed the idea of a systems approach to driver improvement. The literature evidences (1) continued, strong interest in this idea and (2) substantial progress in the development and implementation of effective driver-improvement systems. Major reviews have documented the rationale of systematic approaches; identified necessary conditions and components of systems; and described the delivery and content of programs (Miller and Dimling 1969; McGuire et al. 1976a,b; Coppin 1977; Li 1980; Weidman et al. 1982a,b). Surveys have characterized the scope and implementation of driver-improvement programs in the United States (McGuire et al. 1976a,b; Staplin and Knoebel 1985; U.S. Department of Transportation and American Association of Motor Vehicle Administrators 1986 [also covers Canadian jurisdictions]). These reports greatly reduce the need for another comprehensive review. The purpose of this section, therefore, is to highlight several issues inherent in considering systematic approaches to driver improvement and to outline representative systems proposed in the literature. The overall aim is to indicate the scope and complexity of actions required to develop effective, integrated approaches to driver licensing and improvement.

7.1 Why a "Systematic Approach"?

The recent literature clearly shows the area of driver improvement -- and, by extension, the area of driver licensing -- in a difficult transition phase. For example, many jurisdictions have begun to move from (1) driver improvement as a collection of separate "treatments" aimed at "problem drivers" and administered by several agencies toward (2) driver improvement as a system in its own right, most often as a functional component (or subsystem) in the larger, driver-licensing system. The transition involves more than obtaining a legislative mandate; or simply increasing administrative efficiency; or giving greater prominence to driver improvement per se. Rather, the evolutionary trend represents a process of rationalizing driver-licensing and driver-improvement practices in the context of traffic safety. Thus, to

fixing of blame and the administration of penalties (Myrick and Schlesinger 1964). Problem drivers may be punished, but the problems they have go untreated.

It is important to note that both premises above presuppose a state of affairs not evident in many jurisdictions. Traffic safety is not a fully coherent enterprise, nor has it received a priority high enough to drive the philosophical shifts and structural changes needed to organize a complex, hierarchical array of diverse elements and functions. At the heart of the matter, public concern over deaths, injuries, and economic losses due to traffic accidents is hardly commensurate with the magnitude of the problem. The present level of societal response to the problem reflects the low degree of public interest (Simpson 1985, 1986). Moreover, the field of traffic safety cannot yet offer a well-developed conceptual framework (much less a theory-based blueprint) for a systems approach (Joscelyn and Jones 1978). Finally, a great many elements and functions that would comprise a traffic-safety management system already exist, albeit the province of separate agencies at several different levels (Federal, Provincial, regional, local) and in different sectors (public, private). The process, therefore, involves not so much creating elements of a system as establishing efficient communication links and enhancing cooperation among these agencies (Myrick and Schlesinger 1964; Kaestner 1974; Joscelyn and Jones 1978). Simarily, Coppin (1977, p. 107) remarked in the specific context of driver licensing and improvement:

> It appears upon reviewing the historical development of driver licensing that the two programs (driver re-testing and re-examination and driver control of physical and mental limitations) lacked coordination and administrative control. Today it is recognized that driver control activities are merely an extension of the licensing process and both programs need to be looked at in a "systems" framework rather than as independent efforts. It is unfortunate that more thought has not been given to this systems approach to driver control. Had such been the case, it might have been possible to develop more effective (and efficient) control countermeasures.

Although incomplete, the case for systematic approaches to driver improvement has strengthened in the past decade. One cannot overemphasize the contribution of California's Department of Motor Vehicles in developing, testing, refining its system. A major component of this ever-evolving system -- the Post Licensing Control Reporting and Evaluation System (now replaced by the Negligent Operator Treatment Evaluation System [NOTES]) -- enabled the Department to demonstrate not only the effectiveness of their strategy but also its net benefits (e.g. Kadell et al. 1978; Marsh and Kadell 1985; Peck and Kadell 1983). The system as a whole has worked more effectively than the impact of each part added together.

Cast in the negative, empirical support for systematic approaches comes from analyses demonstrating the inherent limitations of driver licensing and driver improvement as separate functions. Coppin (1977) has summarized relevant facts clearly and succinctly. With respect to the belief that a large number of crashes can be prevented by simply removing drivers with poor records from the road, the evidence indicates otherwise:

- Over 80% of all crashes in a given year involve drivers who have not had crashes during the preceding two years.
- About one-half of all crashes in a given year involve drivers who have not had any convictions for moving violations during the preceding two years.
- Less than three percent of drivers are "problem drivers" (operationally defined as those with more than 4 convictions or crashes in a three year period).
- There is a statistical relationship (correlation) between a driver's crash record and the number of convictions he has received for traffic violations. The relationship, however, is too low for any practical utility in predicting future crash involvement.
- As a group, problem drivers are involved in about three times as many crashes as average drivers.
- Young drivers are involved in a disproportionately high percentage of crashes and this high rate cannot

be totally explained to be the result of increased exposure.

As a result..., it can be concluded that --

- o There is no method of accurately predicting future crash involvement of individual drivers.
- o Driver improvement programs, while justified on the high rate of crashes for repeat violators, will not prevent a major proportion of total crashes. (Coppin 1977, pp. 9-10)

With respect to the driver-licensing process as a means to increase traffic safety, Coppin (1977) outlined why movement toward a diagnostic/educational approach is justified:

- o Driver behaviour is only one of many components of the traffic safety system.
- o Driver behaviour is only one of many factors in crashes.
- o Scores on license examinations have been shown to be correlated with crashes but the relationships are too low for predictive purposes.
- o There is no method of accurately predicting future crash involvement of individual drivers.
- o Consistent with the constraints posed by the socio/political system within which driver licensing operates,
  - -- test difficulty and cut-off scores on examinations must be such that the large majority (over 90%) of applicants will ultimately be granted a license to drive; and
  - -- examinations must be constructed so that they are easily understood and are not socially culturally biased to any sub-population group.

As a consequence of the above:

- o License testing has limited value as a selection device.
- o License testing should be viewed more as a diagnostic-remedial process than as a screening process.

> o As a diagnostic-remedial process the objective becomes one of determining weakness and providing assistance, counsel, or information as needed.
>
> The operation of a driver licensing program as suggested above avoids the pitfalls and problems pointed out by Reese [1971]. It avoids denying licenses on the basis of poor selection instruments that can be challenged in court. It also has a great deal of public appeal in that it attempts to determine deficiencies and correct them, rather than to deny the exercise of mobile liberty needed by most people. (Coppin 1977, p. 34)

Developments in the area of driver improvement show a progressive integration of the driver-improvement function with driver licensing. Indeed, as reviewed below, the distinction between driver improvement and driver licensing has blurred considerably. In addition, in virtually all jurisdictions in the U.S. and Canada, driver-licensing agencies now have primary responsibility for most driver-improvement actions, from warning letters to interviews to such licensing actions as restriction and suspension (U.S. Department of Transportation and American Association of Motor Vehicle Administrators 1980). Models of driver-improvement systems as well as systems now in operation confirm widespread acceptance of "systematic approaches".

7.2 A Review of Driver-improvement Systems

The project conducted by McGuire et al. (1976a,b,c) represents a milestone in the literature on driver improvement. Based on (1) a comprehensive review of the literature published up to the mid-1970s and (2) a survey of state driver-improvement programs, these authors identified "desirable attributes of a driver improvement program" and organized them as a "model driver improvement system". In defining the system's purpose, functions, components, and sequence of treatments, McGuire et al. successfully operationalized the idea of a systematic approach to driver improvement. (Although an overview of their model system is presented below, those readers interested in systematic approaches to driver improvement will still find it valuable to read the original reports in their entirety.)

Figure 1 reproduces a diagram showing interrelationships among basic components of the system. Consistent with discussion in the preceding subsection, McGuire et al. identify the state's overall philosophy and objectives in the area of traffic safety as "probably the single most effective determinant of a state's driver improvement program" (p.41):

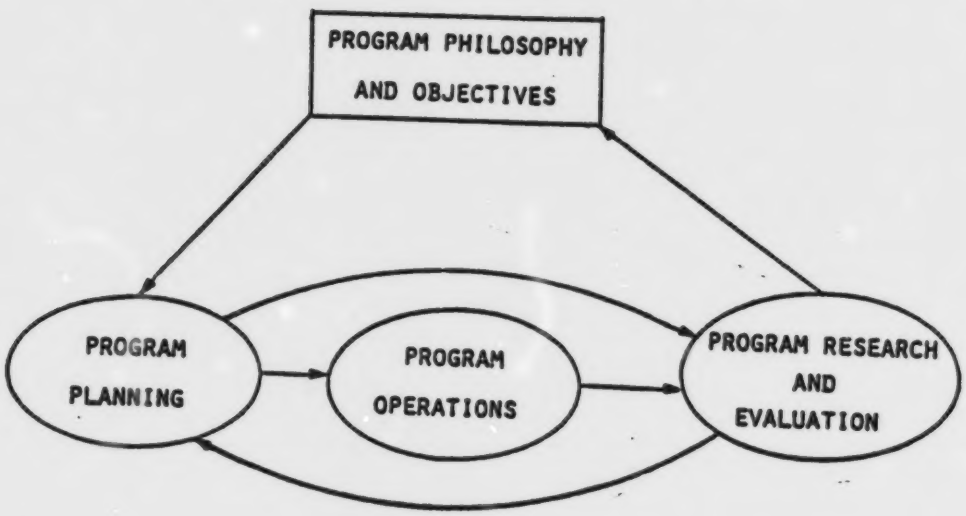
> This will influence the approach to driver improvement taken by the state which in turn will influence the types of programs utilized and the types of personnel employed. The philosophy and objectives of the program are included as a model component and they are viewed as the major directing force in driver improvement. Using this as a point of reference, the model driver improvement system is characterized by three additional basic components: Planning, Operations, and Research/Evaluation, as shown in Figure [1].
>
> The planning activities are conducted in terms of the specified and implied philosophy and objectives of the system. Planning activities directly influence both program and operations and program research/evaluation. In addition, the results of the research/evaluation activities eventually directly influence the planning component. The planning component deals with questions relating to funds, personnel levels and equipment as well as with questions of expected program impact and satisfaction of objectives. The operations component describes the everyday operation of programs. Areas such as screening/record systems and program coordination are included in this component. The research/evaluation component deals with questions of effectiveness, evaluation measures and research. This component eventually can influence the state's philosophy/objectives through the acquisition of new data and evaluation of both long-existing and innovative programs.

The ultimate objective of the model driver-improvement system is to reduce traffic crashes, deaths, and injuries. Toward that end, programs are established that (1) identify various groups of problem drivers; and (2) reduce their risk of crash involvement through communications, education, special treatment, or penalties.

McGuire et al. discussed a series of topics relevant to philosophy and objectives. Decisions regarding these factors will dictate specific approaches to the model system:

Figure 1

Model Driver Improvement System Component Interrelationships



(McGuire et al. 1976a, p. 42)

1. Program Management: A function of philosophy and objectives, "the management activity pervades all of the system components -- planning, operations and research/evaluation. It is probable that improving system management over the current level offers more potential than improving treatment elements" (p. 43, emphasis added).

2. Driver Improvement Program Target Group, Content and Sequence: Two sets of questions -- the nature of target groups and of treatment program characteristics -- must be addressed at the outset.

3. Incentives to Increase Participation of Problem Drivers: Examples include point count reductions, extension of license expiration date for good performance, and a "caseload" approach with driver improvement counsellors.

4. Opportunity for Driver Self-correction: The system should allow drivers to improve before severe action (i.e., suspension) is taken. A series of opportunities (letters, meetings) is recommended.

5. Discretion in the System: Limited discretion (e.g., a counsellor's ability to assign particular treatments) as opposed to inflexible, mandatory programs based on specified criteria (e.g., point counts), may be considered.

6. Background/Training of Driver Improvement Personnel: "If the goals and objectives of a state's driver improvement program are to positively influence driver behavior, then it is appropriate to recommend that the individuals conducting the driver improvement program should have, at a minimum, a bachelor's degree in psychology or a related behavioral science. It is evident that the implementation of this recommendation might be difficult, particularly on a statewide basis. As an interim organizational approach to this difficulty, a state could establish a bi-level program in which most driver improvement activities would be handled routinely, much as is currently done in many states. Those cases requiring the services of special counsellors, would be referred to members of a select cadre of driver improvement personnel who have the required training and background" (p. 46).

7. Ability to Serve the Needs of Drivers with Problems: Two fundamental approaches should be considered. First, a diagnostic assessment of problems evidenced by drivers. Second, extending treatment to a larger proportion of the driving population (e.g., lowering

the "point threshold" for certain treatments; adopt an educational/remedial mode of driver license examination as opposed to the screening/selection mode).

8. Opportunity for System Self-correction: "Included among the approaches to driver improvement should be the ability of the system to monitor the effectiveness of its current programs and determine the utility of innovative programs through controlled research. The philosophy of the state should foster such evaluations and investigations in order that optimal use may be made of limited funds through the elimination of ineffective programs and introduction of innovative cost-effective ones" (p. 47).

Decisions made concerning the philosophy and objectives of the driver-improvement system will determine the extent to which requirements for other components can be met. The planning component, for example, should concern itself with assessing (1) program impact and (2) program cost. Commitment to these activities will enable administrators to justify both on-going programs and changes to the system, for example, the initiation of new and innovative programs and the termination of cost-ineffective programs.

The "heart" of the model driver-improvement system described by McGuire et al. is the operations component. Crucial to its function is an automated driver-record system either compatible with driver-improvement activity or designed for application within the driver-improvement system. Expansion of existing data sets; acquisition of software necessary for increased search capabilities and program operation (e.g., warning letters, notices to appear); and other modifications will incur costs considerably outweighed by the immediate and long-term benefits of the driver-improvement program.

To maximize the effectiveness of the driver-improvement system, coordination among all agencies involved in generating data on drivers and in delivering treatments is essential. Maintenance of up-to-date, complete data relevant to driver improvement will require a "two-way information flow" between the licensing agency and the courts. Effective

communication between agencies can minimize duplication of effort and waste of resources.

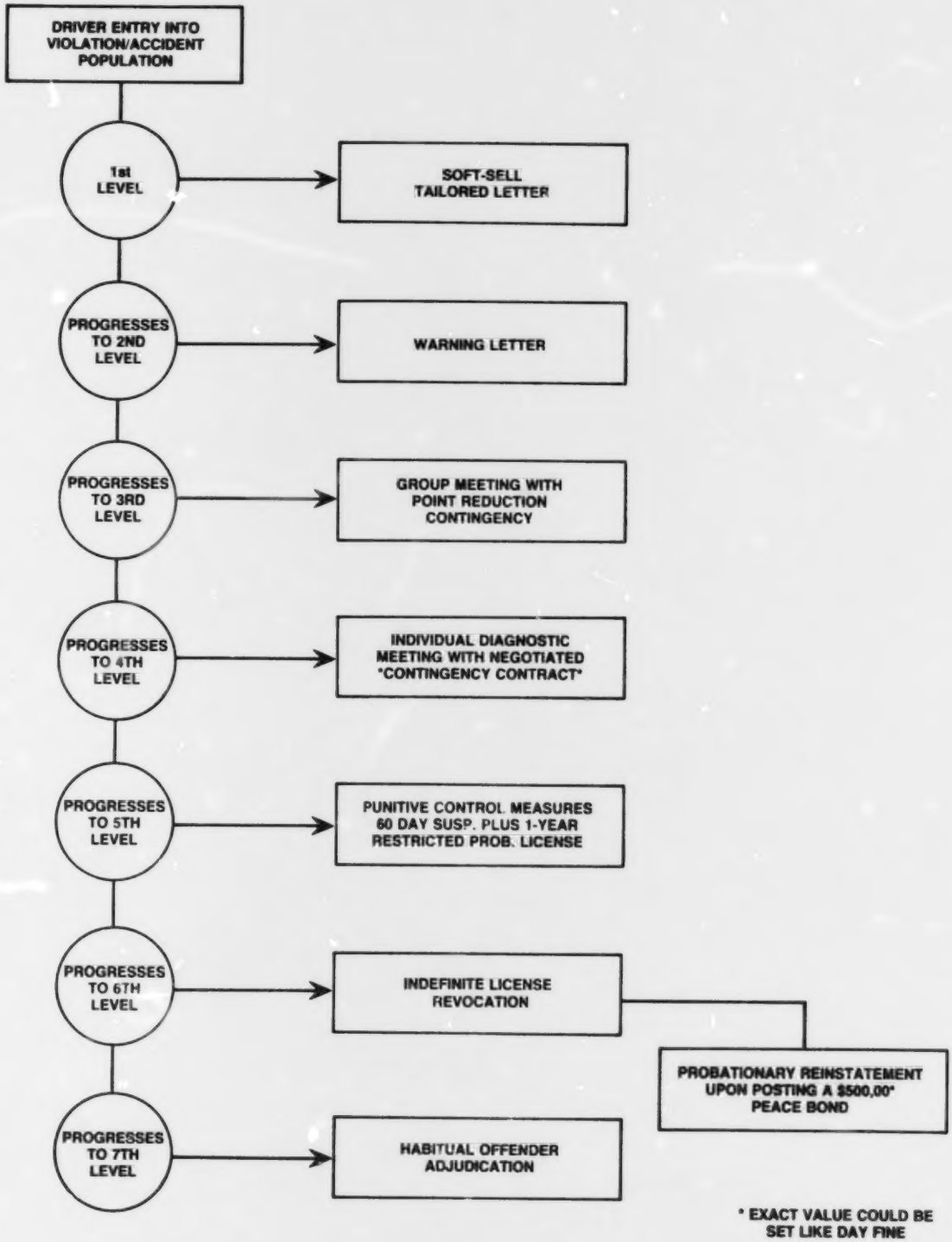
> The exact nature of the coordination mechanism employed in a given state will depend on the nature of driver improvement organization in that state. It is important that an attempt is indeed made to coordinate driver improvement activities. Many states have recently endured budget cuts and hiring freezes in traffic safety related areas. To continue to carry out driver improvement activities in an inefficient, uncoordinated fashion will not only prove costly, but could eventually prove impossible. (McGuire et al. 1976a, pp. 50-51).

Figure 2 illustrates the content and sequencing of driver-improvement programs in the model system. The treatments progress from the inexpensive and "arm's-length" for the "minimal violator" to the more costly and obtrusive for the "advanced recidivist".

> The program is advantageous because it results in a large number of drivers being treated, thereby maximizing the net potential impact of driver improvement on accidents. Also, the per unit cost of treatment tends to be positively correlated with the driver's record and since most drivers do not recidivate to advanced records even when untreated, the use of minimal treatments at lower point counts results in relatively small per unit expenditures and is conducive to more attractive cost benefit ratios. Furthermore, there is no persuasive evidence that expensive treatments are more effective than less expensive treatments.
>
> A discussion of the proposed treatment model is presented below. To provide a notion of the treatment potential of the program sequence, an estimate is included in parentheses of the number and percent of California's 13 million drivers that would receive the first treatments if the program were implemented. The percentages would vary slightly from state to state because of the variations in point system or entry criteria.
>
> 1. Entry level treatment (2 million; 15%): This should not be presented as a warning letter but rather a factual statement that the licensing agency is aware of the entry and desires to work with all drivers toward reducing future incidents of high risk driving.

Figure 2

MODEL DRIVER IMPROVEMENT PROGRAM SEQUENCE


DRIVER ENTRY INTO VIOLATION/ACCIDENT POPULATION
1st LEVEL
SOFT-SELL TAILORED LETTER
PROGRESSES TO 2ND LEVEL
WARNING LETTER
PROGRESSES TO 3RD LEVEL
GROUP MEETING WITH POINT REDUCTION CONTINGENCY
PROGRESSES TO 4TH LEVEL
INDIVIDUAL DIAGNOSTIC MEETING WITH NEGOTIATED "CONTINGENCY CONTRACT"
PROGRESSES TO 5TH LEVEL
PUNITIVE CONTROL MEASURES 60 DAY SUSP. PLUS 1-YEAR RESTRICTED PROB. LICENSE
PROGRESSES TO 6TH LEVEL
INDEFINITE LICENSE REVOCATION
PROBATIONARY REINSTATEMENT UPON POSTING A $500,00* PEACE BOND
PROGRESSES TO 7TH LEVEL
HABITUAL OFFENDER ADJUDICATION
* EXACT VALUE COULD BE SET LIKE DAY FINE

(McGuire et al. 1970a, p. 52)

2. Second level treatment (780,000; 6%): This should be a low threat, non-aversive communication but presented as a warning letter.

3. Third treatment level (88,000; 0.65%): Unlike many current traffic schools, the program length should be in the range of 2-6 hours, with no more than two sessions. Emphasis should be on reducing risk-taking behavior, and minimizing risks through defensive driving and anticipatory hazard detection. This treatment is suitable for most driver improvement environments.

4. Fourth level treatment (50,000; 0.38%): This should be a one contact, one-on-one treatment, ranging from one to three hours in length. Emphasis should be placed on diagnosing the driver's problems and identifying the stimuli and contingencies that are producing continued violations.

5. Fifth level treatment: This treatment is self-explanatory. In a sense, it represents a final attempt to achieve improvement prior to resorting to the ultimate negative sanction of revocation. This is the first entirely "negative" sanction in the proposed model.

6. Sixth level treatment: This is also self-explanatory with the exception of the peace bond. The concept here is to allow drivers to become reinstated after a period of time if they post a $500 bond. Each four months of point-free driving will be rewarded by returning $100 to the subject until 80 percent of the bond is returned. Instead of a fixed bond, the amount of the bond could be proportional to the driver's income. This arrangement is similar to the concept of a "day fine" used in Scandinavia (Ross, 1975).

7. Seventh level treatment: Drivers who continue to violate while under revocation are outside of the control of the licensing authority's power. The concept of habitual offender powers, in which such drivers are in essence prosecuted as "public health" risks and incarcerated, appears to the only alternative to doing nothing more at all. The effectiveness of these "habitual (traffic) offender" laws is currently under investigation and their utility has yet to be established.

It should be noted that the unit cost of the low level treatments (letters) is such that about 750 drivers can be treated for the cost of treating one driver at the

fourth (individual counseling) level (California, 1973). (McGuire et al. 1976a, pp. 51,53)

McGuire et al. (1976a) based their model system on "rational considerations and trends in empirical research" (p. 54). They stressed, however, the requirement for replication of prior research "because the expected size and duration of treatment effects (on accident criteria) are very limited and because each state represents a different operational environment and target population" (p. 54). The model itself must be considered tentative; developing an effective driver-improvement system is an "iterative and evolutionary process", a process in which a research/evaluation component becomes integral and indispensable. "The products of the research and evaluation component should influence the program philosophy and as a result influence the planning component and eventually the operations component" (p. 54). The evolutionary changes in California's approach to driver improvement exemplify the functional value of the research-evaluation component recommended by McGuire et al. (California Department of Motor Vehicles 1985).

In a project initiated after completion of the one by McGuire et al. (1976a,b,c), Weidman et al. (1982a,b) undertook to develop a driver-improvement system for traffic violators. This effort centered on the "operations component" as defined by McGuire et al. (see above). Reports produced by Weidman et al. describe the content and sequence of elements included the driver-improvement system and document three courses and one meeting developed for use in the system.

As discussed by Weidman et al., the driver-improvement system was designed to address three common shortcomings evidenced by current programs:

- belated initiation of action (deferring action until drivers accumulate a large number of points; ignoring large numbers of drivers who might benefit from early intervention);
- discontinuity of action (drivers allowed to accumulate points for additional convictions after a

contact with the system without "triggering" further responses for each subsequent conviction);

- o arbitrary determination of action (abrupt termination of actions can lead to perceptions of unfairness in classifying and penalizing violators).

To overcome these limitations, Weidman et al. applied the following principles in designing their system. First, the severity of driver-improvement action would correspond to the seriousness of a driver's record. Severity involved increasingly punitive actions at greater cost. Early, inexpensive actions would allow the reaching of greater numbers of drivers and (presumably) decrease the numbers of drivers requiring more intensive action. The authors further assumed that gradual, rather than sudden, introduction of severe sanctions (such as license suspension) would enhance public acceptance of the system. Second, a simple point system would form the basis for identifying drivers for action. This approach might be better understood by drivers -- and less costly to administer. Third, once a driver "enters" the driver-improvement system, each additional conviction elicits a further response from the system. This feature further reduces the need for complex point systems and ensures no action is repeated for a given driver. Fourth, following any action, drivers enter a period of "gradual exit" from the system. During this period, an additional conviction "neither subjects them to more severe action nor ignores them as it would a nonoffender" (p. 12). The rationale for gradual exit is threefold:

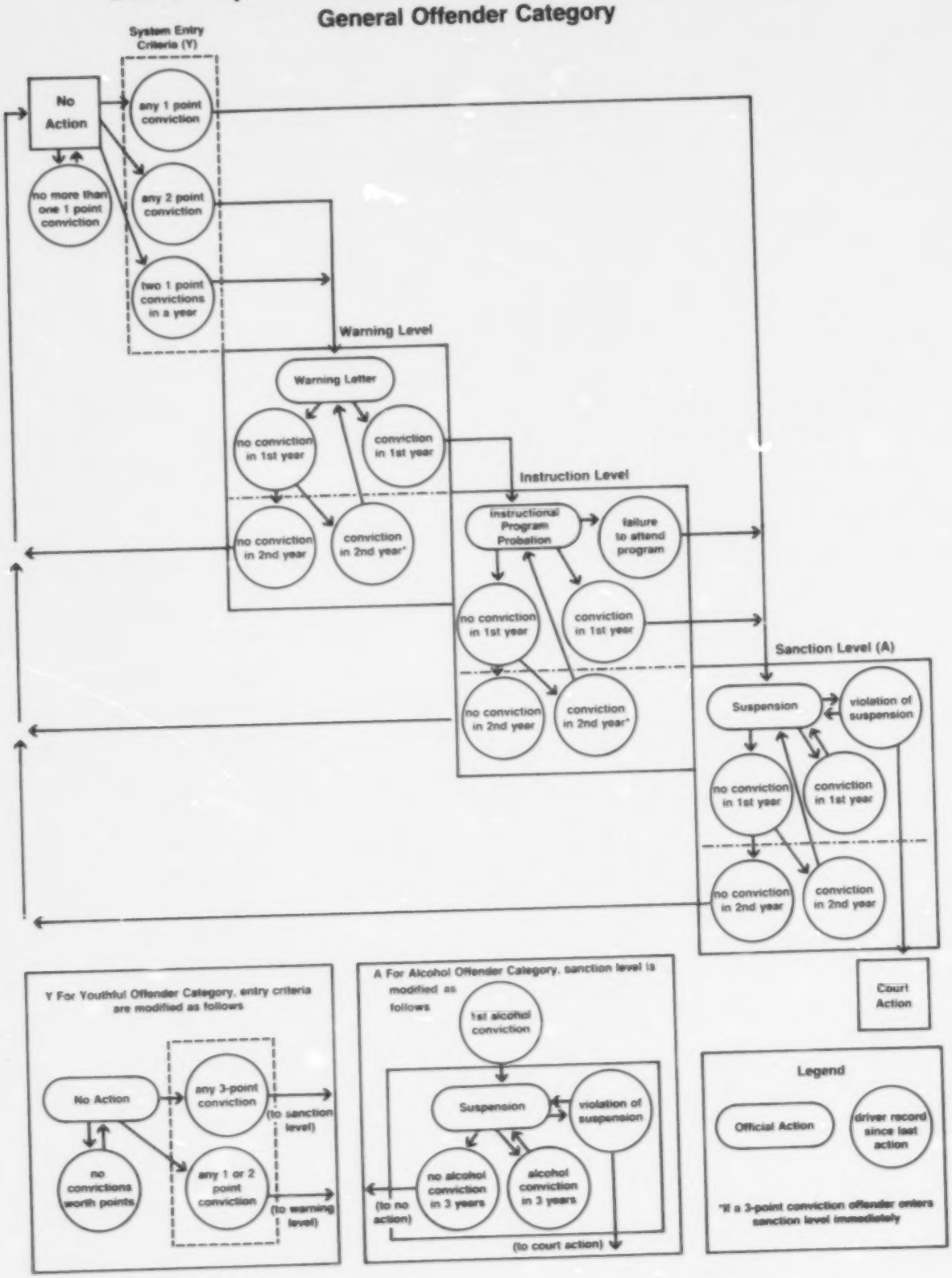
- o Recognizes that frequent offenders are not a menace one day and simply ordinary drivers the next.
- o Rewards offenders who go violation-free for a period of time without completely "letting them off the hook".
- o Allows driver improvement action to be reimposed more quickly than would be possible if the driver had left the system.

Figure 3 shows the driver-improvement system developed by Weidman et al. The system's structure -- content and sequence -- is defined by three

Figure 3

Driver Improvement System for Traffic Law Violaters

General Offender Category


System Entry Criteria (Y)
No Action
any 1 point conviction
no more than one 1 point conviction
any 2 point conviction
two 1 point convictions in a year
Warning Level
Warning Letter
no conviction in 1st year
conviction in 1st year
no conviction in 2nd year
conviction in 2nd year*
Instruction Level
Instructional Program Probation
failure to attend program
no conviction in 1st year
conviction in 1st year
no conviction in 2nd year
conviction in 2nd year*
Sanction Level (A)
Suspension
violation of suspension
no conviction in 1st year
conviction in 1st year
no conviction in 2nd year
conviction in 2nd year
Court Action
Y For Youthful Offender Category, entry criteria are modified as follows
No Action
any 3-point conviction
(to sanction level)
no convictions worth points
any 1 or 2 point conviction
(to warning level)
A For Alcohol Offender Category, sanction level is modified as follows
1st alcohol conviction
Suspension
violation of suspension
no alcohol conviction in 3 years
alcohol conviction in 3 years
(to no action)
(to court action)
Legend
Official Action
driver record since last action
*If a 3-point conviction offender enters sanction level immediately

(Weidman et al. 1982a, p. 13)

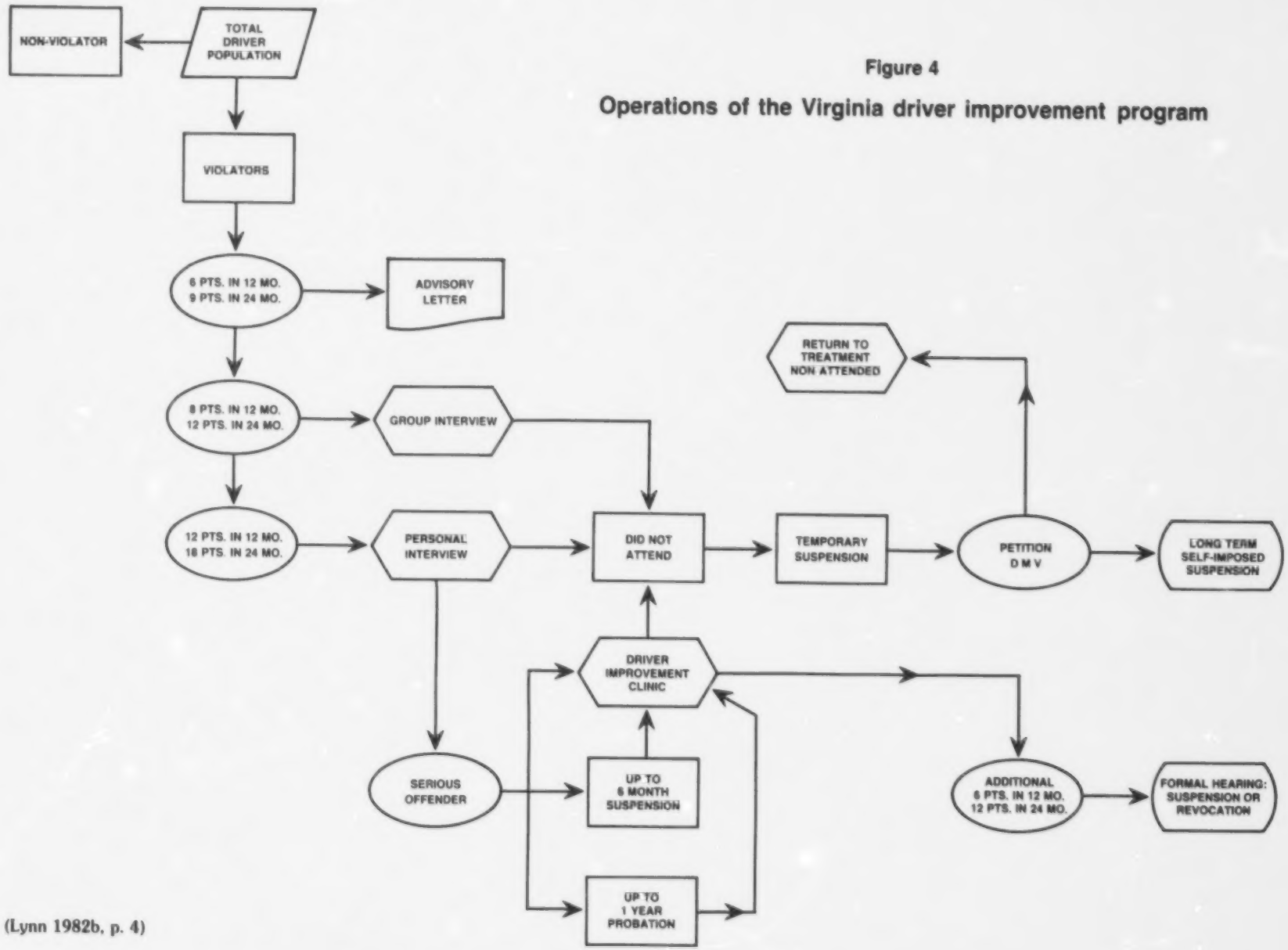
levels of action; characteristics of target groups; and criteria for initiating action. Levels of action include (I) a warning letter; (II) an instructional program combined with imposition of probation; and (III) license suspension. Convictions after reaching this level may result in more lengthy suspension and additional sanctions imposed by courts outside the system (e.g., fines, jail sentences). Three categories of drivers are general offenders, youthful offenders, and alcohol offenders. The system allows earlier entry by youthful drivers and quicker imposition of Level III actions for alcohol offenders. Criteria for entry into and progression through the system (points accumulated and convictions) are shown in Figure 3.

In addition to the work by McGuire et al. (1976a,b,c) and Weidman et al. (1982a,b), others have put forward models and recommended driver-improvement systems. In our opinion, however, none of these other reports matches the scope and general significance of the model systems described above. For example, Li (1980) reviewed driver-improvement literature and recommended five types of programs: selective renewal testing; warning letters; group educational meetings; conditional probationary licenses; and suspension. These five programs "can be coordinated to form a comprehensive driver improvement system" (p. 52). Of interest, Li selected group educational meetings (GEM) as one of the programs for inclusion, probably because past evaluations showed positive results. This tactic -- reviewing the evaluation literature and selecting programs on the basis of results in past years and different jurisdictions -- may prove counterproductive. California, for example, found that GEM gradually lost effectiveness and Helander (1984) mentions that the program was dropped. Two points made by McGuire et al. (1976a) are illustrated: (1) a rational choice among program alternatives is possible, but the assumption of effectiveness must be tested; (2) a research/evaluation component is required for any system to measure cost-effectiveness over time and to allow system self-correction.

As discussed earlier in Section 1.0, the evaluation by Lynn (1982b) of Virginia's driver-improvement system further substantiates the wisdom of "testing the obvious". Figures 4 and 5 depict the context and sequence

Figure 4

Operations of the Virginia driver improvement program



(Lynn 1982b, p. 4)

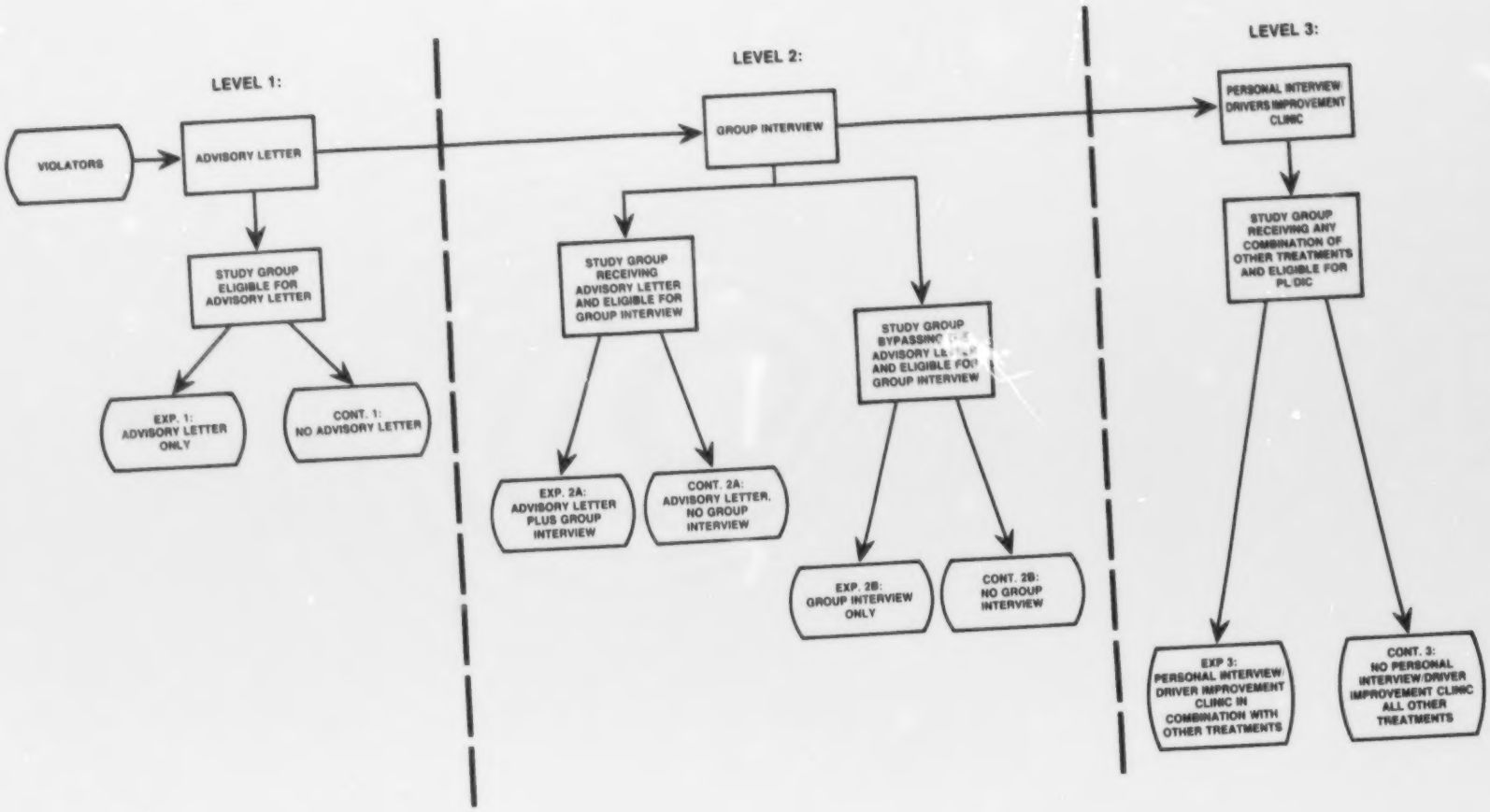

LEVEL 1:
LEVEL 2:
LEVEL 3:
VIOLATORS
ADVISORY LETTER
GROUP INTERVIEW
PERSONAL INTERVIEW DRIVERS IMPROVEMENT CLINIC
STUDY GROUP ELIGIBLE FOR ADVISORY LETTER
STUDY GROUP RECEIVING ADVISORY LETTER AND ELIGIBLE FOR GROUP INTERVIEW
STUDY GROUP BYPASSING ADVISORY LETTER AND ELIGIBLE FOR GROUP INTERVIEW
STUDY GROUP RECEIVING ANY COMBINATION OF OTHER TREATMENTS AND ELIGIBLE FOR PI, DIC
EXP. 1: ADVISORY LETTER ONLY
CONT. 1: NO ADVISORY LETTER
EXP. 2A: ADVISORY LETTER PLUS GROUP INTERVIEW
CONT. 2A: ADVISORY LETTER, NO GROUP INTERVIEW
EXP. 2B: GROUP INTERVIEW ONLY
CONT. 2B: NO GROUP INTERVIEW
EXP 3: PERSONAL INTERVIEW/ DRIVER IMPROVEMENT CLINIC IN COMBINATION WITH OTHER TREATMENTS
CONT. 3: NO PERSONAL INTERVIEW/DRIVER IMPROVEMENT CLINIC ALL OTHER TREATMENTS

Figure 5. Levels of study groups

(Lynn 1982b, p. 13)

of Virginia's program and the study groups to which drivers were randomly assigned, respectively. The program features three levels with fairly common treatments: (1) advisory letter; (2) group interview; and (3) personal interview/driver improvement clinic. Lynn found that the warning-letter treatment had no effect on subsequent accidents and convictions; that drivers attending the group interview had significantly better records with respect to violations (but not accidents); and that the combined letter-group interview treatment had no significant impact on subsequent convictions or accidents. Lynn's finding is important in two ways: (1) a treatment often assumed at least marginally effective and thus widely adopted -- the warning letter -- had no measurable impact by itself; and (2) interactions between treatments may reduce the effectiveness of the system as a whole. Only systematic evaluations would reveal these phenomena.

In California, the Department of Motor Vehicles has substantially revised the "negligent-operator program". A recent report (California Department of Motor Vehicles 1985) describes the new system along with its Negligent Operator Treatment Evaluation System (NOTES). As discussed in this report, the previous system had declined in both effectiveness and benefit-cost figures. Unlike previous changes to the program -- usually one component at a time -- the system as a whole was redesigned. Four levels of treatment include (1) warning letters; (2) notices of intent to suspend; (3) probation hearings; and (4) probation violator sanctions. The report (pp. 3-4) summarized differences between the previous and the current system:

> Table 2 provides a summary of the present "Neg-Op" program. The four levels of the "Neg-Op" program represent a progression of interventions from a general warning to license revocation based on increasing evidence of negligence in the driving record. Although a similar progression was present in the previous program, the new program incorporates several significant changes:
>
> - At each level there is special handling of cases when there is evidence of recent alcohol or drug involvement in the driving record. This feature was absent or inconsistently applied in the earlier program.

Table 2
Summary of Neg-Op Program

		Regular Intervention		Alcohol Intervention	
Level	Name	Driver Record*	Type of Intervention	Driver Record*	Type of Intervention
I	Warning Letter (W/L)	2 Neg-Op Points in 1 year.	A low-threat, general warning.	2 Neg-Op points in 1 year with precipitating conviction being a 2-point violation.	A low threat warning which mentions the dangers of drunk driving.
II	Notices of Intent to Suspend (N/I)	3 Neg-Op points in 1 year, or 5 Neg-Op points in 2 years. or 7 Neg-Op points in 3 years.	A severe warning which threatens license suspension for futher Neg-Op point.	Same as for regular intervention except precipitating conviction must be a 2-point violation.	A severe warning which threatens license suspension for any further Neg-Op points and stresses dangers of drunk driving.
III	Probation Hearings (P/H)	4+ Neg-Op points in 1 year, or 6+ Neg-Op points in 2 years, or 8+ Neg-Op points in 3 years.	Drivers who attend a group hearing are generally placed on probation for 1 year. Drivers who do not attend are suspended for 6 months in addition to the probation.	Two 2-point convictions in 3 years or three alcohol-related incidents in 3 years.	Drivers who attend individual hearing are generally placed on probation for 1 year with an alcohol clause added. Those who do not attend are suspended for 6 months in addition to the probation with an alcohol clause.
IV	Probation Violator Sanctions (P/V)	Accumulation of any Neg-Op point of FTA† during probation.	Generally 30-, 60-, or 90-day suspensions for first violation of probation**, 6-month suspension for second and third violations, and revocation for fourth.	Conviction for a 2-point violation during probation or involvement in any alcohol/drug- related incident if probation includes an alcohol clause.	Six months suspension for first violation of probation- the sanctions are the same as the regular intervention thereafter.

*The actual driver-record criteria used in the program are somewhat more complicated than shown in the table. For a more complete description of the driver records which qualify for each level, refer to pages 4-7.

**Driving while suspended (during probation) results in an additional 6-months suspension for the first violation of probation; any violation or accident which occurred while the driver was suspended is considered (whether or not it is a Neg-Op point).

†FTA: failure to appear in court after being cited for a traffic violation.

(California Department of Motor Vehicles 1985, p. 3)

- While the previous program emphasized warning and counseling (with sanctions against the license being employed only in aggrevated [sic] cases), the current program features sanctions and the credible threat of their imposition as the principal behavior modifiers.

- Interventions are initiated at a lower point count than they were previously, allowing the department to influence the driver's behavior when it is assumed to be more amenable to improvement. Furthermore, this approach removes the most serious offenders from the road earlier.

- Under the previous program, only the issuance of warning letters was fully automated. In the new program, the initial contact at each level is computer generated.

- The previous program only intervened when a conviction entered the driver's record; the current program is triggered by convictions, accidents, and in the case of probation violators, notices of failure to appear in court (FTAs). FTAs for alcohol-related violations are also considered as qualifying incidents for the alcohol intervention at Level III (probation hearing).

- In three out of the four levels, the cost per driver contacted is less than the comparable levels in the earlier program. In the remaining level, the cost of the two programs per driver is equivalent. Overall, the cost per driver is substantially less in the current program, but the total cost of the new program is only slightly lower because many more drivers are being treated.

The evaluation system for the negligent-operator program was also redesigned, the intention being to incorporate the strengths of the old system (Post License Control/Reporting and Evaluation System [PLCRES]) and to avoid its weaknesses (pp. 13-15):

> The strengths of PLCRES were:
>
> - each major component of the Neg-Op program could be evaluated,
>
> - drivers were selected and randomly assigned to treatment or untreated control groups by the

computer process which identified drivers for Neg-Op interventions,

- the evaluations were made by comparing drivers treated by the Neg-Op program to drivers in untreated control groups,

- the evaluation was based on survival-rate methodology -- allowing the most recent program effects to enter the evaluation,

- the evaluation was based on an ongoing system which permitted an assessment of effectiveness to take place at any time rather than relying on the initiation of special projects which usually require two to three years to complete, and

- the system provided continuous monitoring of the control group to ensure that untreated drivers who accumulated unusually bad records would be exposed to Neg-Op interventions.

The Negligent Operator Treatment Evaluation System (NOTES) was designed as the replacement for PLCRES. NOTES retains all of the positive features of the previous system, and it includes the following improvements:

- The new system is more flexible than PLCRES; it has the capability of handling a wide variety of changes to the Neg-Op program without requiring major programming efforts.

- NOTES is designed with the capability of evaluating experimental alternatives to the standard Neg-Op treatment. (In PLCRES such evaluations were difficult to perform and were limited to comparisons of the two groups at any level. The new system can make comparisons among three groups at each level.)

- Assignment to the treatment and control groups is based on a computer-generated random number rather than a procedure based on the terminal digits of license number which was used in PLCRES. The previous method (although completely valid) involves some complications in an ongoing evaluation system which are avoided by using a random number generator.

- Whenever possible NOTES utilizes widely-used statistical software (SPSS and BMDP) to perform data processing and analysis, which allows modification of the system with little or no reprogramming. (In PLCRES some of the computer programs used in the data analysis were tailor-made and written in

assembly language which made them difficult and costly to modify.)

- o As far as possible, all aspects of the data collection and analysis will be automated to minimize costly and time-consuming human intervention.

- o The selection and assignment process will be monitored automatically in order to limit the effect of any problems arising in the process. (Failure to adequately monitor this process in PLCRES caused some data to be lost on a few occasions.)

- o Compared to PLCRES, the statistical power of the new system will be increased by selecting larger numbers of drivers in the control groups, assigning even more drivers to the treatment groups, and pooling samples from year to year whenever it is justified statistically according to a consistent set of decision rules.

Figure [6] presents a schematic diagram of NOTES. Although the diagram is necessarily simplified, it accurately portrays the essential elements of the evaluation system.

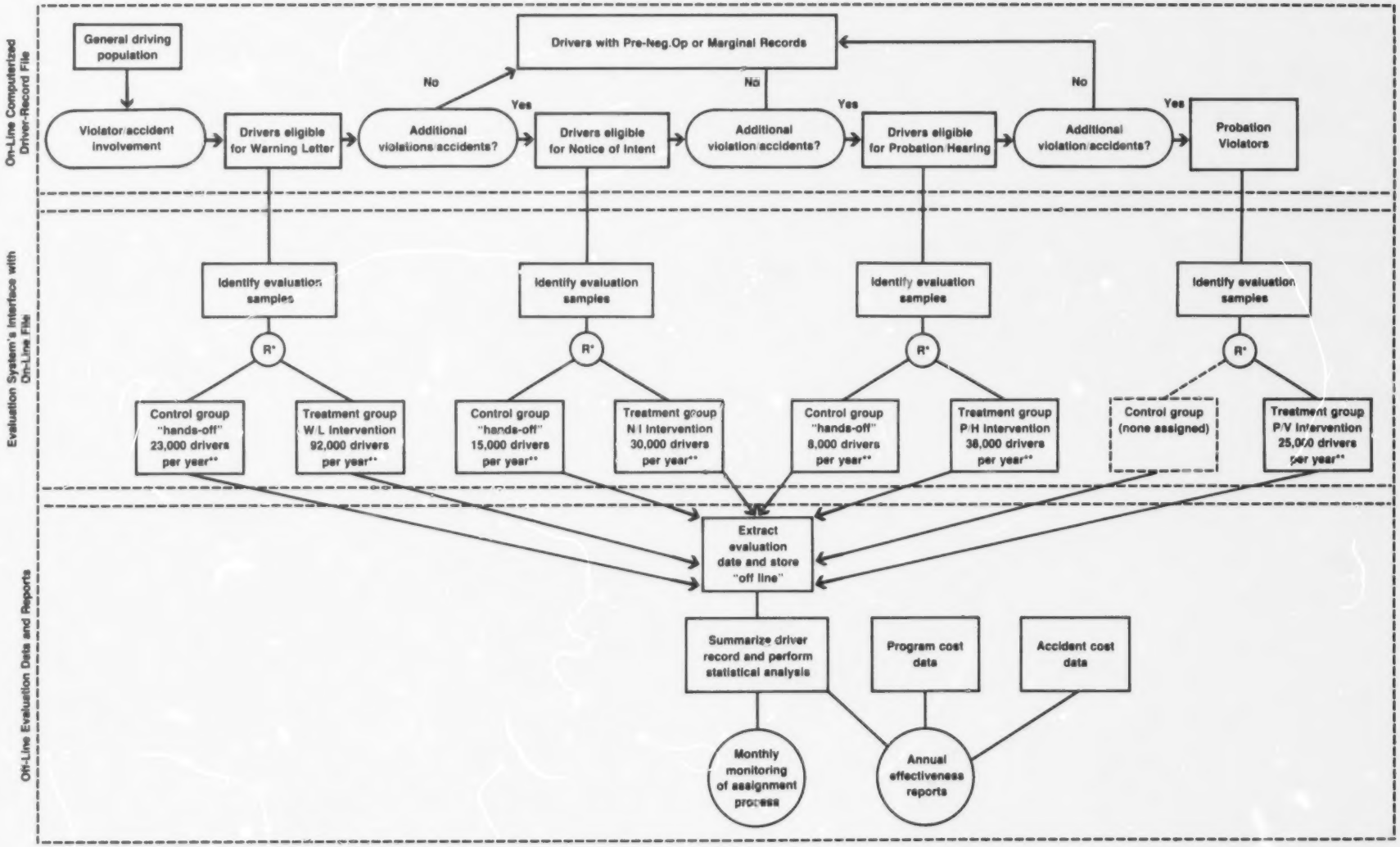
The progress report on the Negligent Operator Treatment Evaluation System (NOTES) also included results of a simulated evaluation of elements of the negligent-operator program. Findings indicated that even with pessimistic assumptions, the present system "can be expected to provide a considerable (at least 64%) increase in traffic safety effectiveness measures compared to the old program....A major reason for the expected increase in traffic safety is the fact that the new program treats a much larger number of Neg-Ops that did the old program" (pp. 28-29).

In December 1985, the California DMV published its first "program effectiveness report" based on NOTES (Marsh and Kadell 1985). Three levels of treatments were under evaluation: (1) warning letter; (2) notice of intent to suspend; and (3) probation hearing. The authors summarized preliminary findings in terms of reductions in numbers of cited drivers:

The present Neg-Op program reduced the number of cited drivers during the first six months after treatment by

Figure 6

Schematic Diagram of the Negligent Operator Treatment Evaluation System (NOTES)


On-Line Computerized Driver-Record File
Evaluation System's Interface with On-Line File
Off-Line Evaluation Data and Reports
General driving population
Drivers with Pre-Neg.Op or Marginal Records
Violator accident involvement
Drivers eligible for Warning Letter
Additional violations accidents?
Drivers eligible for Notice of Intent
Additional violation accidents?
Drivers eligible for Probation Hearing
Additional violation accidents?
Probation Violators
No
Yes
Identify evaluation samples
R*
Control group "hands-off" 23,000 drivers per year**
Treatment group W/L Intervention 92,000 drivers per year**
Control group "hands-off" 15,000 drivers per year**
Treatment group N/I Intervention 30,000 drivers per year**
Control group "hands-off" 8,000 drivers per year**
Treatment group P/H Intervention 38,000 drivers per year**
Control group (none assigned)
Treatment group P/V Intervention 25,000 drivers per year**
Extract evaluation data and store "off line"
Summarize driver record and perform statistical analysis
Program cost data
Accident cost data
Monthly monitoring of assignment process
Annual effectiveness reports

Notes: R* Assignment based on computer-generated, random number.

**These groups contain drivers eligible for the regular and alcohol interventions, and the type of intervention for which the driver is eligible is identified, so the regular and alcohol interventions may be evaluated separately if the size of the samples is sufficient.

(California Department of Motor Vehicles 1985, p. 17)

> 10.2%, 9.9%, and 22.5% at Levels 1, 2, and 3, respectively. All of the reductions found are very reliable statistically (differences this large would occur by chance less than once in 100 if there were no real effects). The percentage reductions are similar to those found for comparable treatments in the previous Neg-Op program. However, the current program treated almost four times more drivers than the previous program; therefore the adoption of the new program has had a much greater impact on the number of citations. Furthermore, the greater impact was achieved with a decrease in total program cost. (p. i)

Because sample sizes were too small and follow-up intervals too short to detect changes or differences in accident rates reliably, an evaluation of the effects of treatments on subsequent accidents was not done. Marsh and Kadell (1985) indicated that an evaluation of the accident-reduction impact of the program would appear in the annual report for 1986.

7.3 Tailored Treatments: The Next Step Forward?

In our opinion, the system currently in operation in California represents the state of the art in driver improvement, having put into practice principles and components recommended by McGuire et al. (1976a,b). Over ten years, both its rate of development and its degree of refinement are unprecedented in the field. Another feature of driver-improvement systems, however, has yet to receive sustained attention, namely, the specificity of treatment for "problem drivers". This issue relates to a possible diagnostic-remedial function of driver licensing-improvement systems. Although California's system does distinguish between drivers with and without apparent alcohol or drug problems, it does not appear to "tailor" treatments for specific kinds of problems drivers might have. In fact, as noted above, California's new system appears heavily reliant on a punitive approach, a return to a more traditional, philosophical stance.

Kaestner (1968, 1972), Miller and Dimling (1969), McGuire et al. (1976a,b), and others have stressed that driver-improvement treatments should be designed to meet the specific needs and characteristics of

problem drivers. For example, in describing an ideal driver-improvement approach, Kaestner (1968) stated that "the ultimate strategy then would be to match drivers with specialized treatment techniques rather than employ the current methods which prescribe the same treatment for all drivers regardless of their unique motives and characteristics" (p. 518). McGuire et al. (1976a,b) refers to this approach as "tailored" or "customized" treatment, which recognizes that drivers become accident-involved for a variety of reasons including lack of sufficient knowledge, skills and/or driving experience, poor attitudes and judgment, the influence of states and conditions such as alcohol and drug use as well as transitory and enduring psychological or emotional conditions, and a myriad of other person-related characteristics.

A tailored-treatment approach could be expected to increase both the cost-effectiveness and the efficiency of the driver-improvement process. The ultimate success of a "driver-sensitive" approach, however, depends upon adequate methods to identify high-risk drivers and to diagnose accurately individuals' "problems" so that they can be correctly assigned to an optimal treatment. For example, the selection and treatment of individuals that are <u>not</u> problem or high-risk drivers (i.e., high-accident probabilities) would result in a substantial misallocation of scarce driver-improvement resources. Of equal importance, the failure of a diagnostic procedure to identify a skill-related problem when one exists could result in a problem driver being mis-assigned to an attitude-change treatment, thereby reducing potential program impact. The following excerpt from Miller and Dimling (1969) further illustrates the importance of diagnostic evaluation in determining specific treatment:

> Suppose that a diagnostic evaluation of the driver's performance indicated that his errors consisted of numerous aggressive and irresponsible acts characteristic of psychopathic personality deviates, that the driver received feedback informing him of this fact and that the required course of action involved personality modification through psychotherapeutic intervention. The first three conditions necessary for the modification of performance exist, but the fourth--the ability to undertake the corrective actions called for--may not be possible, either because the individual cannot afford the

> time or money necessary for treatment, or because scientific and professional techniques for the modification of psychopathic personalities have not yet been developed. Recognition of the importance of this fourth condition enables us, at the very least, not to waste time and effort on variables which cannot be changed.

Obviously, very little improvement in driving performance would have been obtained had the above individual been assigned to an all-purpose group meeting or to a more specific skill-oriented Defensive Driving Course.

The remainder of the present section considers the following two questions, both intimately related to the issue of tailored treatment:

- How are problem or high-risk drivers identified?
- What diagnostic devices are typically employed to match drivers to specific treatments?

7.3.1 Identification of problem or high-risk drivers. In the parlance of traffic safety, problem or high-risk drivers are persons whose illegal and unsafe driving behaviour makes them more likely to be involved in a road accident. An initial step in the driver-improvement process, therefore, is to identify drivers who are expected to have crashes. Typically, point systems have been used to identify such drivers. As first introduced in the State of Connecticut in 1947, the point system was "a method of designating drivers for corrective action on the basis of a point score which is accumulated through commission of traffic offenses with various demerit points" (Campbell 1973; Coppin 1977). According to Coppin (1977), the original purpose of the point system was to select problem drivers for some type of program, and not to use point counts as the basis for mandatory action. The point system, however, is typically employed for licensing actions, that is, as a means to identify frequent violators for the purpose of suspending or revoking their license (Williams 1979). Cameron (1975) has questioned whether a demerit-point system is of benefit in the absence of efforts towards driver improvement. He observes that:

> If only contact made with an offending driver were to be a notice advising him that his license has been suspended, then it seems unlikely that much benefit would result. As in the case of the rat in the maze receiving an electric shock, it is information feedback which causes the offending driver to mend his ways. He needs to be made aware that his behaviour has come to the attention of the authorities. (p. 187)

While retaining a provision for automatic license suspension, many jurisdictions, therefore, operate with some kind of direct approach to problem drivers, ranging from warning letters through group and individual meetings.

Demerit-point systems have come to serve two primary purposes: (1) to identify, by means of weighting traffic violations according to some a priori evaluation of severity, problem or high-risk drivers; and (2) to apply treatments to problem drivers based on the level of accumulated point totals. The ability of a demerit-point system to operate as an effective selection and/or treatment decision-making device has been questioned. For example, demerit-point system operates on the basis of driver records that contain information on convictions and reported accidents. Miller and Dimling (1969), however, observed that such records are "regarded by most knowledgeable and reasonable researchers as being notoriously incomplete, unreliable, biased, and invalid" (Ross 1960). They note that:

> the relation between the number of violations which a driver commits and the number of convictions which he receives has not been clearly established, except that, in terms of sheer number, it appears certain that frequency of commission is much greater than frequency of citation or conviction. Conviction frequency cannot even be regarded as a representative sample of violation frequency, because convictions are subject to a great many influences such as the nature and extent of enforcement in the area in which the citation is given, the severity of the local judge, the particular emphasis being placed during current safety campaigns, etc. Such parameters are likely to have as much an effect on conviction frequency as actual violation frequency.
>
> In summary, the extent to which the list of violations entered on the record of a driver is an accurate, unbiased, valid, and reliable sample of the violations which

> he actually commits in real life is unknown. Even the accidents on a driver's record do not reflect with complete accuracy the real accident situation. It is probable that almost all serious personal injury and fatal accidents that occur are reported. The same may not be true for less serious accidents however.

Despite problems associated with completeness and accuracy of driver records, convictions have traditionally served as surrogate measures of risk and most point-count systems use convictions as the only crite ion for determining risk and directing post-licensing control activities (Helander 1984). There is some question, however, as to whether point counts (i.e., convictions) are a valid and reliable predictor of high risk drivers. Coppin and Peck (1965; as cited in Coppin 1977), for example, question the reliability of point values assigned to the violations as predictors of crashes. Based on an exhaustive investigation in California, they concluded that "the establishment of complex point systems (where types of violations become the point values) cannot be justified from the results of this study.... the findings seem to indicate that a simple summation of a conviction into a total conviction frequency variable would serve as well as any combination of violation weights".

Several studies have shown only a low correlation between convictions and crashes (Coppin 1977; Peck and Kuan 1983). Goldstein (1973) contended that drivers selected because of their accidents may be more amenable to treatment than drivers selected on the basis of violations. A recent investigation by Helander (1984) provides supportive evidence that favours accident over conviction history as a basis to select drivers for treatment.

Given the low predictive value of driver-conviction (point) histories, several studies have attempted to identify a set of variables that more accurately predict subsequent accident-involvement frequency (Stewart and Campbell 1972; Peck et al. 1971; Harano et al. 1975; Peck and Kuan 1983). For example, in Pennsylvania, Staplin and Knoebel (1985) examined a combination of seventy-one driver performance, driver characteristics, vehicle, and demographic factors. They found that eight

variables correctly classified 79.1% of the sample into accident versus no-accident categories: age, vehicle age, vehicle type, sex, number of points, number of DUI violations, total number of occurrences of point violations in the last three years, and population density of operator's place of residence.

Even more extensive efforts than those in Pennsylvania have been undertaken in earlier California studies. For example, Harano and Peck (1971) correlated a total of 337 independent variables with an accident criterion and found 140 were significant predictors of accidents. In a review of this study and others, Peck and Kuan (1983) report that:

> person-centered variables that have proven to be statistically significant predictors of accident involvement include driver's prior traffic conviction record, prior traffic accident record, age, sex, socio-economic status and driving mileage. Certain psychological traits and attitudes have also been shown to correlate with accident involvement but the relationships have not proven to be sufficiently consistent or strong to warrant routine use of psychometric instruments. (p. 371)

Prediction of accident involvement remains difficult because accident risk is a complex stochastic (or probabilistic) function of many variables. Peck and Kaun (1984), for example, elaborate on the difficulties associated with predicting <u>individual</u> accident risk:

> Although a number of correlates of individual accident liability have been found, it would be incorrect to conclude that the majority of accidents are caused by a small number of "accident-prone" drivers or that individual accident involvement (and accident losses) can be predicted with a high degree of precision. Several large scale studies have documented the fact that the majority of accidents in any time involve drivers with average or good prior driving records. It has also been pointed out that the statistical nature of driver accident frequencies make it impossible to accurately predict which individuals will and will not be involved in accidents. For example, Peck et al. (1971), using a Poisson fitting technique developed independently by Newbold (1972) and Cobb (1940), reported that even an infallible prediction battery could not predict more than 15% of the variance in the three year accident frequencies of the California male driving population.

> There is obviously a substantial amount of luck or chance in determining accident involvement because of the complex chain of interactive events that determine a given accident occurrence. A very negligent driver may not become accident-involved for long periods through pure luck, whereas a safe driver may have the misfortune of being victimized by some other driver's carelessness. All of the factors operate to suppress our ability to predict accurately the accident involvement frequencies of individual drivers. (p. 372)

In summary, while techniques to identify high-risk drivers remain imprecise, demerit-point systems and associated driver-record systems provide at the very least a basis to identify frequent offenders and accident repeaters. Research continues to play an important role in driver improvement, by refining the techniques and methods to identify those drivers with given characteristics that are more likely than others to be involved in accidents. Here, cohort studies conducted in collaboration with licensing agencies represent a powerful tool to generate practical knowledge.

7.3.2 Diagnosis and treatment of problem drivers. Kaestner (1968) stated that the development of diagnostic tools to identify the specific needs of individual drivers was a priority for the area of driver improvement. Basically, driver-improvement approaches seldom consider the influence that personal factors have on driver failures. According to Miller and Dimling (1969), for example, drivers are not getting adequate feedback regarding adequacy of driving performance. They state:

> Any individual who gets involved in a series of accidents, or who receives a series of citations, is receiving fairly clearcut feedback that something is wrong with his driving performance. It appears obvious that he must be doing something wrong, but he does not know just exactly what. What may be needed here is not just measures of "end-result" variables such as accident involvement or violation convictions, but rather some measures of "intermediate-result" variables, i.e., information about which specific aspects of his driving performance are not up to par. (p. vi-15)

Similarly, little attention is paid to the role of attitudinal or psychological factors in accident involvement. Typical approaches are (1) to mandate treatment at certain point counts or (2) to allow a driver-improvement analyst to decide, largely by intuitive means, appropriate treatments to impose on problem drivers. Suppose, however, that a male driver age 18 and a male driver age 45 had accumulated the same point counts that trigger driver-improvement action. If the young driver's conviction record derives from skill deficiencies and the older drivers from a poor attitude, it is unlikely that requiring both drivers to attend the same treatment would have identical outcomes. In this context, Goldstein (1974) called for studies designed to measure and predict improvement following treatment -- i.e., differential responsiveness to various treatments as a function of driver characteristics. Few studies, however, have considered treatment-by-subject interactions and those that have examined only basic demographics such as age and sex. Nevertheless, several studies have found an interaction between treatment and subject groups. For example, McBride and Peck (1970) reported a differential effect of warning letters by age and sex on accidents. Based on their findings, they concluded that the low-threat letter should be used for female drivers and married males under 30 and that the standard letter should be used for all other drivers. While these letter-treatment effects were not replicated in a follow-up study by Epperson and Harano (1970), the initial results underscore the possibility and potential value of matching subgroups of drivers with specific treatments to optimize improvement outcomes.

Drummond and Torpey (1985) reported an evaluation of a driver-improvement program in Victoria, Australia. Although the educational program itself seemed no more effective than the standard punitive approach, one feature of the authors' research deserves special mention. They did post hoc analyses, which they called "diagnostic research", to identify selection criteria that may have lead to greater effects of the program. Drummond and Torpey (1985, p. 12) described this exercise as "hypothesis hunting" rather than "hypothesis testing". Of interest, they found that, for a driver subpopulation with one or more casualty accidents in the prior year, a significantly longer time elapsed before

their becoming involved in another accident compared to the time elapsed for the equivalent comparison group. They stressed, however, that the hypothesis of program impact on this subgroup of drivers must be tested before conclusions could be drawn. The study by Drummond and Torpey (1985) illustrates an iterative approach to driver improvement that could lead, in time, to greater effectiveness in treatments -- given appropriately selected drivers for the various treatments.

According to McGuire et al. (1976a), "treatment tailoring generally implies that drivers are measured, that the results are analyzed to arrive at a diagnosis and that the drivers are then assigned to treatments designed to remedy the problems implied by the diagnosis" (p. 28). McGuire et al. could, however, only identify one study by Henderson and Kole (1967a,b) in New Jersey involving diagnosis "in which the drivers received a battery of tests, were informed of the results and were counseled accordingly" (p. 28). He noted, however, that "all drivers were really processed in the same way and received very similar treatment".

In California, Finkelstein and McGuire (1971) evaluated the first stages of a tailored-treatment approach. Negligent drivers attending a Group Educational Meeting were administered a comprehensive battery of tests, covering attitudes, cognitive skill, personality traits, demographic factors, psychomotor tasks and other variables. Investigators described subjects in terms of twelve dimensions and nine driver types, several of which were interpreted as having treatment implications. In a follow-up investigation (mentioned above), Harano and Peck (1971) examined the relationship between driver types and subsequent driving record. A total of 337 independent variables were correlated with an accident criterion and 140 were found significant predictors of accidents. Driver-record and criminal-record variables proved to be the most important predictors, whereas psychological variables did not play a major role.

Considerable work remains before complex relationships between person-centered variables and accident involvement can be understood.

Available procedures provide only a crude means of identifying potentially high-risk drivers. Unfortunately, such methods provide insufficient information to assign drivers to treatments that could realize greater benefits. Progress towards this goal continues. For example, Staplin and Knoebel (1985) developed a driver-improvement index (DII, a multivariate model for the prediction of driving negligence) to (1) establish relative priorities among operators for inclusion in a driver-improvement program; and (2) direct assignment of specific operators to specific treatments. They explained that if drivers receive a DII score indicating membership in the accident group, they will receive high priority for action; the DII score may also justify a more costly (and presumably more effective) treatment. Thus, the explicit assumption is that more costly treatments are more effective (i.e., individual hearing versus group meeting) without careful consideration as to whether these treatments have the desired effect -- accident reduction -- among different subgroups of drivers. Progress in driver improvement might be facilitated if there were more attention given to diagnosing drivers' problems and to designing specific treatments that would resolve these problems in an efficient, cost-effective manner.

7.4 Summary

The purpose of this section has been to expand on the idea of driver improvement as a "systems problem". Systematic approaches to driver improvement has gradually replaced separate and uncoordinated programs administered by several agencies. This trend represents a concerted effort to rationalize driver-licensing and driver-improvement practices in the context of traffic safety. The contention is that, by systematizing otherwise related structures and activities, substantial progress toward reducing traffic-crash losses can be realized.

The rationale for developing systematic approaches depends on two premises. First, road accidents are not only driver failures but also system failures. Second, traditional approaches to driver licensing and driver improvement have not (and cannot) serve the aims of traffic safety in an optimal way. Current systems are not problem-solving in

nature; rather, emphasis is placed on the administration of penalties. Problem drivers are punished, but problems that drivers have go untreated.

In fairness to driver-licensing agencies, the above premises and criticism of existing systems presuppose conditions not satisfied in most jurisdictions. For example, traffic safety itself is not a fully coherent, coordinated enterprise. Public concern over traffic accidents (or traffic-crash risk) is not great -- except as it relates now to alcohol-impaired driving. Even today, many agencies and organizations have only partial mandates to carry out activities related to driver improvement. Nonetheless, evaluation studies have amply demonstrated (1) that systematic approaches can work more effectively than do programs carried out separately; and (2) that driver licensing and driver improvement as integrated functions have great potential to advance the cause of traffic safety.

Models of driver-improvement systems have been developed and actual systems have been implemented in many jurisdictions. In fact, recent developments have considerably blurred the distinction between driver licensing and driver improvement. In this context, a jurisdiction's overall philosophy and objectives in traffic safety determine its approach to -- and, ultimately, the effectiveness of -- driver-improvement programs implemented by driver-licensing agencies. Other essential components in advanced driver-improvement systems include planning, operations, and research/evaluation. Decisions made concerning the philosophy and objectives of driver-improvement systems will dictate the extent to which requirements for other components can be met. To maximize the effectiveness of a driver-improvement system requires careful coordination of all agencies involved in generating data on drivers and in delivering treatments.

A set of principles have been suggested for consideration in designing the operational component of driver-improvement systems. First, the severity of driver-improvement action should correspond to the seriousness of a driver's record. Second, a simple point system should form

the basis for identifying drivers for action. Third, once a driver enters the driver-improvement system, each additional conviction or accident should elicit a further response. Fourth, following any action, the driver should gradually exit from the system. Fifth, different categories of offenders (for example, youthful drivers, persons convicted of impaired driving, others) should not necessarily receive the same treatments.

Model driver-improvement systems have been based on "rational considerations and trends in empirical research". Experts have stressed, however, the requirement to replicate prior research and evaluation. Developing effective driver-improvement systems in different jurisdictions, with different driving populations, during different time periods is an interactive, evolutionary process, a process in which research and evaluation become indispensable. For example, only an integral research/evaluation component will allow administrators and staff to measure cost-effectiveness over time and allow rational system self-corrections. Each jurisdiction should consider the example of California's Department of Motor Vehicles, which has implemented a driver-improvement system representing the state of the art.

The idea of tailored treatments to address specific needs of drivers who evidence a higher risk of accident involvement represents the diagnostic-remedial function of driver-improvement systems. This strategy explicitly recognizes that different groups of drivers fall into the general category of "problem drivers" for many reasons, from lack of skills to poor attitudes, from chronic medical conditions to acute states like alcohol impairment. If high-risk drivers can be identified and their specific problem(s) diagnosed, then tailored-treatment approaches could be expected to increase both the cost-effectiveness and the efficiency of the driver-improvement process.

The identification of problem (or high-risk) drivers has largely depended on "demerit-point systems", in which various numbers of demerit points are assigned to traffic offenses and drivers are selected for corrective or punitive action based on point totals. The reliability and validity of approaches based solely on demerit points as shown by

driving records has been strongly questioned. In particular, research has demonstrated little need for complex point systems; instead, the simple sum of convictions for traffic offenses adequately serves the same purpose. Nevertheless, a driver's history of convictions does not necessarily predict subsequent accidents with acceptable accuracy.

Several studies have improved upon demerit-point systems by taking into account a number of other variables, including personal characteristics (e.g., age, sex, socio-economic status), type of vehicle, exposure to risk, and environmental characteristics (e.g., population density). Although methods to identify high-risk drivers remain imprecise, due in part to the probabilistic nature of road accidents, both demerit-point systems and related driver-record systems at least provide a starting point for identifying different groups of frequent offenders and accident repeaters. Continued research in this specialized area would assist in refining techniques needed to identify these groups of drivers for proactive, remedial treatment. In this context, cohort studies conducted in collaboration with licensing agencies represent a powerful tool to advance knowledge for practical applications.

However efficiently high-risk drivers are identified, it is unlikely that computer-based systems can diagnose specific problems in terms of driving histories. (Obvious exceptions to this generalization are persons with two or more convictions for alcohol-impaired driving offences; the greater the number of such convictions, the greater the likelihood that "problem drinking" or "alcohol deperdence" explains poor driving performance.) The state of the art in problem-driver diagnostics, however, is not far advanced. An iterative approach to developing methods of assessment and referral seems required. For example, studies using best-available methods and diagnostic tools would be conducted to measure the differential responsiveness of drivers to treatments as a function of driver characteristics and other variables considered significant predictors of accident involvement. Based on findings of these studies, methods to increase the selectivity of the referral process and the specificity of treatment programs could be developed. If the most effective treatments for higher-risk drivers are also the

most costly (an assumption that seems valid, but which should be tested), then tailored treatments offer great promise in streamlining and lowering the overall cost of driver-improvement systems -- not only in terms of programmatic costs, but also in terms of foregone crash losses.

PART FOUR

CONCLUSION

8.0 CONCLUSIONS AND RECOMMENDATIONS

It would be presumptuous of us to put forward firm conclusions and specific recommendations to driver-licensing agencies and others concerning how to develop and implement driver-improvement programs -- whether "systematized" or not. Over the course of this study, we gathered little information on current operational realities, for example, on political and economic constraints facing those who would advance the practice of driver improvement in Canada, the United States, or other jurisdictions. We have gained, however, insights into the history, current practices, and potential benefits of driver-improvement efforts. In this section, therefore, we offer general conclusions and recommendations for consideration by those concerned with driver improvement.

8.1 The Functional Role of Driver Improvement in Traffic Safety

In general, the primary purpose of driver-improvement efforts has been to identify "problem drivers" and to take actions aimed at reducing the likelihood of their committing further violations and, more importantly, having additional traffic accidents. Thus, driver-improvement programs and such licensing actions as probation or suspension, represent post-licensing control, which complements pre-licensing education and at-licensing tests to qualify new drivers. In practice, therefore, driver improvement has largely served a reactive, or "after-the-fact", role insofar as traffic safety is concerned. Drivers become "problem drivers", then they receive attention from licensing authorities.

Two trends evident in the literature suggest a more extensive role for driver improvement. First, driver improvement has become a functional subsystem in many driver-licensing systems and, in some jurisdictions, one component of strategies to increase traffic safety. Second, driver-improvement programs now include far greater numbers of drivers than the comparatively small group of "problem drivers". The rationale for integrating driver-improvement and driver-licensing functions is straightforward. Driver-licensing agencies have both the means and the

authority to identify, monitor, and deal with all drivers. Moreover, by preventing drivers' entry into more costly driver-improvement programs and thus minimizing the load on the system, greater traffic-safety benefits can be gained.

Based on our review of the literature, we find strong support for initiatives that would (1) more fully realize traditional aims of driver improvement and (2) more completely integrate driver-improvement functions throughout the driver-licensing process. For example, in dealing with drivers identified as potentially hazardous, agencies responsible for selecting clientele for driver-improvement programs should concentrate on intermediate processes designed to diagnose problems drivers have and to refer drivers to those programs that deal specifically and effectively with different driving problems. In addition, the concept of driver improvement should be broadened to include all stages of the licensing process: pre-licensing (driver education and training); at-licensing (testing and qualification); and post-licensing (monitoring of driver performance, remedial training and rehabilitative programs, punitive actions [including removal from the driving population]). In essence, we recommend that driver-improvement and driver-licensing functions be amalgamated.

Such an amalgamation has profound implications for driver-licensing agencies. No longer would strictly administrative functions be of principal concern. Rather, objectives directly concerning traffic safety would have equal or higher priority. The prevention of traffic violations and road accidents and the cost-effectiveness of programs and processes would become explicit goals, not just hoped-for results, of actions taken by driver-licensing/improvement agencies.

8.2 Components of a Driver-improvement System

Traditional cornerstones of society's approach to traffic safety -- engineering, traffic-law enforcement, driver education, driver licensing and control -- each represent one or more well-established "systems". Both broader concepts of and more inclusive approaches to driver improvement will necessarily involve many if not most of these existing

systems. "Integration" of driver-improvement structures and activities will require more coordination and better communication among the many agencies already involved in traffic safety. For example, the delivery of some driver-improvement programs may demand involvement of nongovernmental organizations and service providers. Each jurisdiction's approach to developing and implementing more extensive (and more intensive) policies and programs will be guided by decisions concerning key components of driver-improvement systems.

As discussed in Sections 2.0 and 7.0, both the philosophy (or orientation) and the stated objectives of driver-improvement initiatives have great bearing on further specification of a systematic approach to driver improvement. For example, driver-improvement programs strictly considered as control measures aimed at problem drivers will have lesser scope and fewer implications for agencies involved in traffic-safety policy, planning, and regulation. In contrast, the idea of driver improvement as a function operative throughout the licensing process (pre-licensing, at-licensing, and post-licensing stages) suggests more profound changes in present practices and a more complex process in actualizing the idea. For example, because "nonproblem drivers" will be recipients of communications or participants in programs aimed at preventing their becoming problem drivers, nonpunitive approaches that do not alienate but instead motivate persons to drive more safely must be considered. The notion that most drivers are not targets of potential action by licensing authorities but rather possible partners in the traffic-safety movement may seem naive or idealistic; nonetheless, to gain the willing support, cooperation, and participation of drivers, this orientation may be essential to the evolution of individual and community-based action to complement governmental efforts to increase traffic safety.

Concerning other components of driver-improvement systems -- planning/development, operations, research/evaluation -- the literature on driver improvement offers a clear message: Past experience and current practices offer an adequate basis for designing (or re-designing) driver-improvement systems; however, whichever operational programs are selected for implementation, each program and every system should be tested,

evaluated, and monitored. For example, many excellent studies have demonstrated the potential effectiveness and cost-effectiveness of different driver-improvement programs. Much of the recent work in driver improvement, however, comes from comparatively few jurisdictions, most notably California. Programs found effective in one jurisdiction may not prove effective elsewhere. Evaluations of similar programs or comparable types of programs do not always produce positive results -- even in the same jurisdiction over time! Unfortunately, given widespread interest in "bottom-line" evaluations (that is, whether or not a program was generally effective or cost-effective), information is not usually available on how or why a given program or system worked -- or did not work. Thus, basic questions concerning why certain types of programs are effective in some jurisdictions but not in others; why programs work well for a time, then lose effectiveness; and why programs improve subsequent driving performance among some groups of drivers but not among other groups with similar driving records, simply cannot be answered. Presumably, factors important in determining the overall effectiveness of driver-improvement programs include the design, content, and actual conduct of programs; the personal characteristics of drivers required to attend them; and the qualifications and training of personnel selected to deliver programs. Unfortunately, driver-improvement programs in most jurisdictions are not documented in the detail needed to assess which factors might explain differences in program effectiveness. Even more to the point, investigators have rarely sought to gather information required to measure empirically how, why, and for whom a program did or did not achieve its objectives. As a consequence, each jurisdiction now seeking to develop (further) a driver-improvement system cannot assume that programs frequently found effective in other jurisdictions will have the same degree of effectiveness, even if a specific program could be replicated in its entirety.

The present state of knowledge indicates that each jurisdiction must adopt an "experimental posture" and rely heavily on an evaluation/research component as an integral feature of any driver-improvement system. Because the effectiveness of "canned programs" cannot be guaranteed, and because an effective program may not remain effective

over time, the longterm success of driver-improvement efforts will depend on the system's ability (1) to monitor driver performance as reflected in driver records; (2) to evaluate the impact and cost-effectiveness of programmatic elements on an on-going basis; and (3) to carry out applied research on those factors and conditions thought to influence the system's effectiveness, both positively and negatively. In this context, policies and regulations that specify the mandate and delineate the scope of driver-improvement initiatives should explicitly allow -- even encourage -- flexibility in the operations of the system. A system's ability to self-correct and to adapt to changes in driving populations or driving environments seems essential to its vitality and viability. In this sense, a strategic outlook, which is the functional role of policy and planning components, must direct, even drive, tactical (or operational) components.

Here, the functional value of evaluation and research as intelligence-gathering mechanisms cannot be overemphasized. At a minimum, each jurisdiction should commit to developing and maintaining a driver-improvement evaluation system like that in operation in California (the Negligent-Operator Treatment Evaluation System [NOTES]). Capital investments required to establish and operate such support systems appear to yield benefits far exceeding their costs. Not least among the benefits of systems that monitor and evaluate the operational effectiveness of driver-improvement programs is the minimization of "opportunity costs" incurred by continuation of demonstrably ineffective programs. In addition, any resistance to change, whether resistance comes from within the system or from external special interests, can be overcome more easily if "hard data" on program effectiveness are available to justify change, from revision of a program's content to its outright termination and possible replacement. Again, the California Department of Motor Vehicles exemplifies this approach to "system self-correction and adaptation".

8.3 Making the System Responsive to Drivers' Needs

In our overview of driver improvement, we reviewed a series of papers that suggested driver-improvement systems be problem-solving in nature,

rather than strictly punitive (Myrick and Schlesinger 1964; Miller and Dimling 1969; Kaestner 1974 -- see Section 1.2). Myrick and Schlesinger (1964) advocated a systems approach in which even problem drivers themselves would be considered part of the system, representing a valuable source of information on possible malfunctions in the system as a whole. Miller and Dimling (1969) stressed the need for diagnostic methods that would assess each driver's problems and provide specific treatment as needed. Kaestner (1974) developed these ideas; extended the concept of driver improvement to include a diagnostic-remedial process that begins when people become eligible for licensing and lasts throughout their driving career; and identified "improvables" in larger systems related to drivers and to driving itself.

What emerges from these and other papers on driver improvement is a set of requirements that must be satisfied to advance the state of the art:

- an operational definition of the driving task, along with a more precise specification of standards of acceptable driving performance;
- valid measures of driving performance, driver capability, and drivers' risk of crash involvement;
- accurate, sensitive methods designed to diagnose problems drivers have or encounter;
- identification of major subgroups of problem drivers, followed by development of special programs designed to address their particular needs; and
- referral and screening processes whereby identified problem drivers are directed to programs specific to their needs.

From an administrator's point of view, these requirements might appear drawn from a researcher's "wish list". None of these "requirements" is satisfied fully by the present state of knowledge or by currently operative systems. To advance knowledge and to improve driver-improvement operations along these lines would obviously require more research. Although many administrators concerned with driver improvement might consider research valuable in a practical sense, few if any would contemplate underwriting a program of research on the scale implied by

the above list of requirements! Nor should they, unless they reside in jurisdictions with very ample resources for research and program development.

Nonetheless, two general themes present throughout the literature on driver improvement bear repeating, namely, (1) that driver-improvement programs should deal with actual driving and driver problems as specifically as possible; and (2) that evolution of driver-improvement systems and, in particular, operational components, is possible through iterative approaches, whereby knowledge is gained through taking action on problem-driving itself (cf. Donelson 1985, pp. 183-190). The first theme relates more to the cost-efficiency of programs than to cost-effectiveness per se. For example, a program may be cost-effective in that benefits (including costs prevented) exceed costs of providing the program; a program can also be cost-efficient if only those drivers most likely to benefit from the program are directed to participate. In this sense, a cost-efficient program will be more cost-effective than the same program with less careful selection of driver-participants. The second theme relates to developing, testing, and evaluating chosen programs with a twofold aim: (1) identifying cost-effective programs; and (2) identifying potential cost-efficient programs, were only those drivers who benefitted assigned to them.

With the exception of programs designed especially for persons convicted of impaired-driving offenses (e.g., Traffic Injury Research Foundation of Canada 1986), driver-improvement programs developed to deal with discrete subgroups of problem drivers are rare indeed. Rather, persons identified as "problem drivers" through entries on driver records are assigned "treatments" based on accumulated demerit points or other, equally nonspecific criteria. Despite consensus that driver records provide a less than adequate basis for identifying drivers most likely to have (or cause) a future traffic accident, most jurisdictions still rely solely on driver records as a means to mandate certain treatments for all drivers meeting record-based criteria.

Understandably, of course, driving records offer the only means available to assess driver performance without meeting people face-to-face to

discuss their records and past experience (violations and/or crash involvements). But, because drivers' records serve (at best) to identify problem drivers who may represent a hazard to themselves and others, and because record-based criteria cannot (as yet) specify appropriate treatments, the notion of programs "tailored" to address different problems drivers have must remain a goal not achievable in the immediate future. (Again, exceptions to this generalization are persons convicted two or more times of impaired-driving offenses.) Although the driver-improvement literature indicates that drivers selected on accident-based criteria are more likely to benefit from participation in some types of programs, the present state of knowledge offers little more guidance in pre-selecting drivers for various treatments available in a jurisdiction.

Given the above considerations, an iterative approach to increasing a system's inherent responsiveness to drivers' needs is necessary. Basically, program A is developed and/or implemented for problem-driver group X. Upon evaluation, compared to appropriate control groups, a subgroup of treated drivers (X^1) will have apparently benefitted from participation in the program, whereas the remainder (perhaps even a majority) of drivers (Y) will not have evidenced improved driving performance. Analyses of demographic variables, prior driving records (for example, the seriousness of past traffic violations or accidents), and other characteristics of treatment subgroups X^1 and Y may suggest (post hoc) hypotheses that, if supported by subsequent tests, may explain why program A was more effective for subgroup X^1 than for subgroup Y. The next step in this process is to maintain program A for those problem drivers meeting criteria for inclusion in subgroup X^1 and either (1) develop, test, and evaluate program B for subgroup Y or (2) divert drivers meeting criteria for subgroup Y to another, nonspecific treatment. The choice between alternatives (1) and (2) for subgroup Y may be determined by its size or by subgroup characteristics identified through previous evaluation studies.

The scale and complexity of driver-improvement systems that feature "tailored treatments" will depend on many factors. Some of the more critical factors include the following:

- the extent to which subgroups of drivers who do and do not benefit from driver-improvement programs can be characterized by variables and descriptors other than those initially used to assign drivers to treatment and control groups;

- the amount of resources available to deal separately with two (or more) driver subgroups identified through evaluation(s) of a driver-improvement program;

- the size of different driver subgroups (both the one successfully treated and the one or more subgroups not positively affected by the program); and

- the cost-effectiveness and the cost-efficiency of potential approaches to delivery of various combinations of programs and other actions (including licensing actions).

The strategy and methods of fostering the evolution of cost-effective (and cost-efficient) driver-improvement systems have been specified, at least in theory. Valid procedures to diagnose the etiology of problems identified "program drivers" evidence in their records; reliably selective referral processes to direct drivers to treatments that address particular problems; and rational development of an array of driver-improvement programs responsive to needs of most problem drivers (or to needs of "nonproblem drivers") remain products that will no doubt emerge from longer-range, systematic, iterative approaches to driver improvement.

8.4 Summary

The literature on driver improvement indicates two general directions for new initiatives: (1) agencies responsible for selecting clientele for driver-improvement programs should concentrate on intermediate processes needed to diagnose and refer drivers to specific programs for particular types of driving problems; and (2) the concept and practice of driver improvement should be broadened to include all stages of the licensing process (pre-licensing, at-licensing, post-licensing). To maximize potential gains for traffic safety, driver-improvement and driver-licensing functions should be amalgamated.

Decisions concerning the philosophy and objectives of driver-improvement efforts will determine the scope and traffic-safety potential of driver-improvement systems. Past experience and current practices provide an adequate basis for further developing driver-improvement systems. Whichever operational programs are selected for implementation, not only each program but also each system should be tested, evaluated, and monitored over time. Because each jurisdiction must adopt an "experimental posture", an evaluation/research component is an essential, integral part of any driver-improvement system. The purpose of this component is to assess the impact and cost-effectiveness of programs and to provide data needed to guide system self-correction and adaptation.

Imposing lists of outstanding requirements for research to advance the state of the art in driver improvement can be developed. Two general needs, however, can be identified. First, driver-improvement programs should deal as specifically as possible with actual driver problems that increase the risk of crash involvement. Moreover, to the extent possible, drivers having problems should be directed to participate in the most appropriate programs. Not only the cost-effectiveness but also the cost-efficiency of driver-improvement programs can be increased. Second, because present knowledge offers little in the way of guidance, jurisdictions must take an iterative approach to maximizing the responsiveness of driver-improvement systems to drivers' needs. Based on evaluation research conducted as selected programs are implemented, subgroups of drivers who appear to benefit from programs will be identified as well subgroups who do not. If such findings are replicated, then only those drivers meeting criteria for subgroups that improve would participate in the programs. Treatments "tailored" to drivers' needs appear to be the next step in further advancing the state of the art in driver improvement. Valid procedures that diagnose problems drivers have; reliably select and refer drivers to specific treatments; and development of an array of programs responsive to drivers' needs can be future products of longer-range, systematic, iterative approaches to driver improvement.

9.0 REFERENCES

Advisory Committee on Road User Performance and Traffic Codes. 1980. Guidelines for Driver Licensing and Driver Improvement Programs in Australia. Department of Transport Australia.

American Association of Motor Vehicle Administrators. 1956. Driver Improvement Through Licensing Procedures. Washington, D.C.: AAMVA.

American Association of Motor Vehicle Administrators. 1965. Driver License Administrators' Guide to Driver Improvement. Washington, D.C.: AAMVA.

Ames, W.A., and Micas, S.L. 1972. Programs and Problems in Rehabilitation of the High Risk Driver. Charlottesville, Virginia: Virginia Highway Research Council.

Bandura, A. 1969 Principles of Behavior Modification. New York, NY: Holt, Rinehart, and Winston, Inc.

Blumenthal, M. 1974. A basis for a model driver improvement program. Paper presented at the California Traffic Safety Education Task Force Workshop on Driver Improvement and Driver Education. Sacramento: State of California.

Brown, K.B. 1975. Traffic Court School Countermeasure. Final Report. Sacramento, California: Sacramento Safety Council.

Burg, A. 1975. Traffic Violations in Relation to Driver Characteristics and Accident Frequency. Los Angeles: University of California Institute of Transportation and Traffic Engineering.

California Department of Motor Vehicles. 1973a. Modifying Negligent Driver Behavior: Evaluation of Selected Driver Improvement Techniques -- A Second Year Follow-up. Sacramento, California: Department of Motor Vehicles.

California Department of Motor Vehicles. 1973b. Post-Licensing Control Reporting and Evaluation System. Progress Report to the Legislature. Sacramento, California: Department of Motor Vehicles.

California Department of Motor Vehicles. 1985. Negligent-Operator Treatment Evaluation System: Progress Report. Sacramento, California: Department of Motor Vehicles.

Cameron, C. 1975. Probationary Licenses and Points Demerit Systems. In: Proceedings of a Seminar of Road Safety and the Law, 184-188. Canberra, Australia: Australian Government Publishing Service.

Campbell, B.J. 1973. Problems in the attempt to define and predict who will be the accident repeater. Paper presented at the First International Conference on Driver Behaviour, Zurich.

Campbell, B.J. 1975. Research report. In: Report on Symposium on Effective Highway Safety Adjudication, Volume II, University of Denver College of Law, pp. 39-45. National Highway Traffic Safety Administration technical report no. DOT-HS-801-780. Springfield, VA: National Technical Information Service.

Chalfant, M. W., and King., G.F. 1960. Reports of Studies on the Effectiveness of Driver Improvement Procedures. Ann Arbor, Michigan: Highway Traffic Safety Centre, Michigan State University.

Cobb, P.W. 1940. The limit of usefulness of accident rate as a measure of accident proness. Journal of Applied Psychology 24: 154-159.

Coppin, R.S. 1962. A controlled evaluation of group driver improvement meetings. Traffic Safety 46: 17-23.

Coppin, R.S. 1975. Research report. In: Report on Symposium on Effective Highway Safety Adjudication, Volume II, University of Denver College of Law, pp. 47-56. National Highway Traffic Safety Administration technical report no. DOT-HS-801-780. Springfield, VA: National Technical Information Service.

Coppin, R.S. 1977. Driver Licence and Driver Improvement Program: A National Review. Australia: Department of Transport.

Coppin, R.S., Marsh, W.C., and Peck, R.C. 1965. A Re-evaluation of Group Driver Improvement Meetings. Report No. 17. Sacramento, California: Department of Motor Vehicles.

Coppin, R.S., and Peck, R.C. 1965. The California Driver Record Study, Parts 1-9. Sacramento, California: Department of Motor Vehicles.

Coppin, R.S., Peck, R.C., Lew, A., and Marsh, W.C. 1965. The Effectiveness of Short Individual Driver Improvement Sessions. Report No. 22. Sacramento, California: Department of Motor Vehicles.

Coppin, R.S., and Van Oldenbeek, G. 1965. Driving Under Suspension and Revocation. A Study of Suspended and Revoked Drivers Classified as Negligent Operators. Report no. 18. Sacramento, California: Department of Motor Vehicles.

Donelson, A.C. 1985. Alcohol and Road Accidents in Canada: Issues Related to Future Strategies and Priorities. Impaired driving report no. 4. Ottawa, Ontario: The Department of Justice, Canada.

Drummond, A.E., and Torpey, S.E. 1985. Driver Improvement Program Evaluation. Road Traffic Authority, Victoria, Australia.

Eberhard, J.W. 1974. Overview of NHTSA research activities in driver education and licensing. In: Future Role of Driver Licensing in Highway Safety, pp. 22-30. Washington, DC: Transportation Research Board.

English, J.W. 1977. Hardship licensing. Traffic Laws Commentary 6(3): 1-62.

Epperson, W.V., and Harano, R.M. 1974. An Evaluation of Some Additional Factors Influencing the Effectiveness of Warning Letters. Sacramento, California: Department of Motor Vehicles.

Epperson, W.V., and Harano, R.M. 1975. An evaluation of some additional factors influencing the effectiveness of warning letters. Accident Analysis and Prevention 7(4): 239-247.

Finkelstein, R., and McGuire, J.P. 1971. An Optimum System for Traffic Enforcement/Driver Control. Final Report. Mountain View, California: GTE-Sylvania Inc.

Forbes, T.W. 1939. The normal automobile driver as a traffic problem. Journal of General Psychology 20: 471-474.

Fuchs, C. 1980. Wisconsin driver improvement program: A treatment-control evaluation. Journal of Safety Research 12(3): 107-114.

Garretson, M.E., and Peck, R.C. 1979. The Effects of "No Action" Negligent Operator Hearings as an Alternative to Hearings Resulting in Probation. Sacramento, California: Department of Motor Vehicles.

Gilbert, E.F., Waller, P.F., and Li, L.K. 1980. Identification of Driver Licensing Research Requirements. Final Report. Chapel Hill, North Carolina: Highway Safety Research Center, University of North Carolina.

Goldstein, L.G. 1963. Driver selection--The logic and logistics. In: Motor Transportation Transactions of the National Safety Congress. Chicago, Illinois: National Safety Council.

Goldstein, L.G. 1964. Human variables in traffic accidents: A digest of research. Traffic Safety Research Review 26-31.

Goldstein, L.G. 1973. Driver Improvement. A Review of Research Literature. Sacramento, California: Traffic Safety Education Task Force, Department of Education.

Goldstein, L.G. 1974. On the future of driver licencing research. In: Future Role of Driver Licensing in Highway Safety, pp. 1-3. Special Report 151. Washington, D.C.: Transportation Research Board.

Goldstein, L.G. 1975. Perspectives on "problem" drivers and programs to improve them. In: Report on Symposium on Effective Highway Safety Adjudication. Volume II, pp. 57-78. National Highway Traffic Safety Administration technical report no. DOT-HS-801-780. Springfield, VA: National Technical Information Service.

Hagen, R.E. 1978. The efficacy of licensing controls as a countermeasure for multiple DUI offenders. Journal of Safety Research 10(3): 115-122.

Hagen, R.E., McConnell, E.J., and Williams, R.L. 1980. Suspension and Revocation Effects on the DUI Offender. Sacramento, California: Department of Motor Vehicles.

Hagen, R.E., Williams, R.L., and McConnell, E.J. 1979. The traffic safety impact of alcohol abuse treatments as an alternative to mandated licensing controls. Accident Analysis and Prevention 11(4): 275-292.

Harano, R., and Hubert, D. 1974. An Evaluation of California's "Good Driver" Incentive Program. Report No. 46. Sacramento, California: Department of Motor Vehicles.

Harano, R.M., and Peck, R.C. 1971. The Effectiveness of a Uniform Traffic School Curriculum for Negligent Drivers. Report No. 37. Sacramento, California: Department of Motor Vehicles.

Harano, R.M., Peck, R.C., and McBride, R.S. 1975. The prediction of accident liability through biographical data and psychometric tests. Journal of Safety Research 7(1): 16-49.

Harrington, D.M. 1972. The young driver follow-up study: An evaluation of the role of human factors in the first four years of driving. Accident Analysis and Prevention 4: 191-240.

Harrington, D.M., and Ratz, M. 1978. The Effectiveness of an At-Home Drivers Licensing Law Test: An Evaluation of the Good Driver Component of California's Selective Testing Program. Sacramento, California: Department of Motor Vehicles.

Heath, E.D. 1962. The driver improvement clinic: A review of the literature. Journal of the American Society of Safety Engineers 7(9): 125-130.

Helander, C.J. 1983. Intervention Strategies for Accident-Involved Drivers: An Experimental Evaluation of Current California Policy and Alternatives. Sacramento, California: Department of Motor Vehicles Research and Development Office.

Helander, C.J. 1984. Intervention strategies for accident-involved drivers: An experimental evaluation of current California policy and alternatives. Journal of Safety Research 15(1): 23-40.

Henderson, H.L., and Kole, T. 1967a. Mass Communication and Group Discussion Techniques. New York: Driver Safety Service.

Henderson, H.L., and Kole, J. 1967b. New Jersey driver improvement clinics: An evaluation study. Traffic Safety Research Review 11, 98, 100-105.

Hill, P.S., and Jamieson, B.D. 1978. Driving offenders and the defensive driving course - an archival study. Journal of Psychology 98: 117-127.

Homel, R. 1980. Penalties and the Drink/driver: A Study of One Thousand Offenders. Volume 1. Main Report. Research Report 7. Australia: Department of the Attorney General and of Justice, New South Wales Bureau of Crime Statistics & Research.

Homel, R. 1981. Penalties and the drink-driver: A study of one thousand offenders. Australian and New Zealand Journal of Criminology 14: 225-241.

Hricko, A.R. 1970. Driver licence suspension: a paper tiger. The Police Chief 37: 20-23.

Johns, T.R., and Pascarella, E.A. 1971. An Assessment of the Limited Driving License Amendment to the North Carolina Statutes Related to Drunk Driving. Chapel Hill, North Carolina: University of North Carolina Highway Safety Research Center.

Joscelyn, K.B. 1976. The role of our legal system in influencing driver behaviour. HSRI Research 6(3): 7-15.

Joscelyn, K.B., and Jones, R.K. 1972. A Systems Analysis of the Traffic Law System. National Highway Traffic Safety Administration technical report no. DOT-HS-800-641. Springfield, VA: National Technical Information Service.

Joscelyn, K.B., and Jones, R.K. 1978. Management of the traffic crash risk: A conceptual framework. Journal of Safety Research 10(4): 148-161.

Kadell, D.J. 1984. The Traffic Safety Impact of Driver Improvement Countermeasures Targeting 55 MPH Speed Limit Compliance. Sacramento, California: Department of Motor Vehicles.

Kadell, D.J., and Peck, R.C. 1979. Post-Licensing Control Reporting and Evaluation System. Negligent Operator Program Costs and Effectiveness. Sacramento, California: Department of Motor Vehicles.

Kadell, D.J., Peck, R.C., and Howe, W. 1978. Post-Licensing Control Reporting and Evaluation System: Negligent Operator Program Costs and Effectiveness. Sacramento, California: Department of Motor Vehicles.

Kaestner, N.F. 1968. Research in driver improvement--The state of the art. Traffic Quarterly 22: 497-520.

Kaestner, N.F. 1972. Human abilities and driver improvement. In: Human Factors and Traffic Safety, (ed.) T.W. Forbes, pp. 348-379. New York, NY: Wiley & Sons.

Kaestner, N.F. 1974. The impact of driver improvement: Do we really want to know? In: Proceedings of a Symposium on Highway Safety Programs: How Do We Know They Work? Chapel Hill, North Carolina: University of North Carolina.

Kaestner, N., 1979. The Effectiveness of Two Alternate Warning Letters. Salem, Oregon: Motor Vehicles Division.

Kaestner, N. 1980. Driver Improvement Schools -- An Evaluation of Two Programs. Salem, Oregon: Motor Vehicles Division Public Information Office.

Kaestner, N. 1983. Driver Improvement Schools - A Second Look. Salem, Oregon: Motor Vehicle Division.

Kaestner, N. and Hawes, B.G. 1977. Effectiveness of Oregon's Habitual Offender Law. Salem, Oregon: Department of Transportation.

Kaestner, N., and Speight, L. 1974. Oregon Study of Driver License Suspensions. Salem, Oregon: Department of Transportation.

Kaestner, N., and Speight, L. 1975. Successful alternatives to license suspension: The defensive driving course and the probationary license. Journal of Safety Research 7(2): 56-66.

Kaestner, N.F., and Syring, E.M. 1967a. Accident violation reduction through brief improvement interviews. Traffic Safety Research Review 11: 99-105.

Kaestner, N., and Syring, E.M. 1967b. The Oregon Driver Improvement Interview Training and Evaluation Study. Salem, Oregon: Department of Motor Vehicles.

Kaestner, N., and Syring, E.M. 1968. Follow-up of brief driver improvement interviews in Oregon. Traffic Safety Research Review 12: 111-117.

Kaestner, N., Warmoth, E., and Syring, E. 1967. Oregon study of advisory letters: The effectiveness of warning letters in driver improvement. Traffic Safety Research Review 67-72.

Kastelle, C.G., and LeSueur, C.M. 1965. An Evaluation of the Pierce County Pilot Program in Driver Improvement Utilizing the Group Method. Olympia, Washington: Department of Motor Vehicles.

Kazdin, A.E. 1975. Behaviour Modification in Applied Settings. Homewood, Illinois: Dorsey Press.

Kelsey, S.L., and Janke, M.K. 1983. Driver license renewal by mail in California. Journal of Safety Research 14(2): 65-82.

Kelsey, S.L., Janke, M., Peck, R.C., and Ratz, M. 1985. License extensions for clean-record drivers: A 4-year follow-up. Journal of Safety Research 16(4): 149-167.

Kerrick, J.C. 1974. What have we learned to date? In: Future Role of Driver Licensing in Highway Safety, pp. 406. Special Report 151. Washington, D.C.: Transportation Research Board.

King, G.F. 1960. A Test of the Effectiveness of Instruction and Probation. Part II of Reports of Studies on Driver Improvement Procedures. East Lansing, Michigan: Highway Traffic Safety Center, Michigan State University.

Klein, D., and Waller, J.A. 1970. Causation Culpability and Deterrence in Highway Crashes. Washington: Department of Transportation.

Kleinknecht, R. 1969. Behaviour Modification of Problem Drivers. Olympia, Washington: Department of Motor Vehicles.

Koppa, R.J., and Banning, K.R. 1981. Young Problem Driver Improvement Project. National Highway Traffic Safety Administration technical report no. DOT-HS-804-104. Springfield, Virginia: National Technical Information Service.

Lee, M.E. 1981. Why current driver improvement research may be irrelevant. Traffic Education 6(3): 20-23.

Li, L.K. 1980. Driver Improvement: A Review with Recommendations for a Comprehensive System. Chapel Hill, North Carolina: Highway Safety Research Center, University of North Carolina.

Li, L.K., and Waller, P.F. 1976. Evaluation of the North Carolina Habitual Offender Law. Chapel Hill, North Carolina: Highway Safety Research Center, University of North Carolina.

Little, J.W. 1972. Administration of justice in drunk driving cases. American Bar Association Journal 58: 950-954.

Lund, A.K., and Williams, A.F. 1984. The Effectiveness of Post-Licensure Driver Training: A Review of Defensive Driving Course Literature. Washington, D.C.: Insurance Institute for Highway Safety.

Lund, A.K., and Williams, A.F. 1985. A review of the literature evaluating the defensive driving course. Accident Analysis and Prevention 17(6): 449-460.

Lynn, C. 1981. An Evaluation of the Short-Term Effects of the Virginia Driver Improvement Program: Interim Report. Charlottesville, Virginia: Highway and Transportation Research Council.

Lynn, C. 1982a. An Evaluation of the Impact of the Virginia Driver Improvement Program on Negligent Driving: 12-Month Interim Report. Charlottesville, Virginia: Highway and Transportation Research Council.

Lynn, C. 1982b. An Evaluation of the Impact of the Virginia Driver Improvement Program on Negligent Driving: 24 Month Final Report. Charlottesville, Virginia: Highway and Transportation Research Council.

Marcus, A. 1979. Driver Improvement Programs: A Review of the Literature. Toronto, Ontario: Ministry of Transportation and Communications.

Marsh, W.C. 1971. Modifying Negligent Driving Behaviour: Evaluation of Selected Driver Improvement Techniques. Report No. 36. Sacramento, California: Department of Motor Vehicles.

Marsh, W.C. 1973. Modifying Negligent Driving Behaviour: Evaluation of Selected Driver Improvement Techniques. A Second Year Follow-up. Sacramento, California: Department of Motor Vehicles.

Marsh, W.C. 1978. Educational Approaches to Driver Improvement: An Experimental Evaluation with Negligent Drivers. Final Report. Sacramento, California: Department of Motor Vehicles.

Marsh, W.C. and Kadell, D.J. 1985. Negligent-Operator Treatment Evaluation System: Program Effectiveness Report #1. Sacramento, California: Department of Motor Vehicles.

Mayhew, D.R., and Simpson, H.M. 1984. Graduated Licensing. Ottawa, Ontario: Traffic Injury Research Foundation of Canada.

McBride Planning Research Analysis, Inc. 1981. An Evaluation of the Iowa D.I. Program. Des Moines, Iowa: Iowa Department of Motor Vehicles.

McBride, R.S., and Peck, R. 1970. Modifying negligent driving behaviour through warning letters. Accident Analysis and Prevention 2: 141-174.

McGuire, J.P., Bernstein, D., Peck, R., Harano, R., and Stroad, K. 1976a. State Driver Improvement Analysis. Report on Program Status/Recommendations. Volume 1 - Summary. National Highway Traffic Safety Administration technical report no. DOT-HS-801-841. Springfield, Virginia: National Technical Information Service.

McGuire, J.P., Bernstein, D., Peck, R., Harano, R., and Stroad, K. 1976b. Driver Improvement Analysis Report on Program Status/Recommendations Volume 2 - Technical Report. National Highway Traffic Safety Administration technical report no. DOT-HS-801-842. Springfield, Virginia: National Technical Information Service.

McGuire, J.P, Bernstein, D., Peck, R., Harano, R., and Stroad, K. 1976c. State Driver Improvement Analysis Report on Program Status Recommendations. Volume 3 - Appendices. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-801-843. Springfield, Virginia: National Technical Information Service.

McGuire, J.P., and Peck, R.C. 1977a. Traffic Offense Sentencing Processes and Highway Safety. Volume 1. Summary. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-802-326. Springfield, Virginia: National Technical Information Service.

McGuire, J.P., and Peck, R.C. 1977b. Traffic Offense Sentencing Processes and Highway Safety. Volume 2. Technical report. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-802-327. Springfield, Virginia: National Technical Information Service.

McKnight, A.J., Hyle, P., and Albrecht, L. 1983. Youth License Control Demonstration Project. National Highway Traffic Safety Administration technical report contract no. DOT-HS-7-01765. Springfield, Virginia: National Technical Information Service.

McMillan, J.A.J. 1984. The achievements, future development and aspirations of the New Zealand Defensive Driving Council. In: Proceedings of the Road Traffic Safety Seminar. Seminar Papers. Volume 1. Wellington, New Zealand: New Zealand Defensive Driving Council.

Miller, L., and Dimling, J.A. 1969. Driver Licensing and Performance. Volume I. Research Review and Recommendations. U.S. Department of Transportation National Highway Safety Bureau report 224. Springfield, Virginia: National Technical Information Service.

Morehead, D.G., and Wood, M.T. 1976. Special Adjudication for Enforcement (SAFE). Final Report. Olympia, Washington: Department of Motor Vehicles.

Murdoch, P.A., and Wilde, G.J.S. 1980. Reward and Punishment in Driver Control. Toronto, Ontario: Ministry of Transportation and Communications.

Myrick, R., and Schlesinger, L.E. 1964. Driver improvement or system improvement? Traffic Quarterly 18(1): 92-104.

Nap, J.N., Scanlon, J.W., Schmidt, R.E., and Wholey, J.S. 1976. If you don't care where you get to, then it doesn't matter which way you go. In: The Evaluation of Social Programs, (ed.) C.C. Abt, pp. 97-120. Beverly Hills, California: Sage Publications.

National Highway Traffic Safety Administration. 1980a. Summary Report on Young Driver Improvement Efforts. Washington, D.C.: Government Printing Office Superintendent of Documents.

National Highway Traffic Safety Administration. 1980b. Comparative Data, State and Provincial Licensing Systems. Washington, D.C.: Government Printing Office Superintendent of Documents.

National Highway Traffic Safety Administration. 1985. Comparative Data, State and Provincial Licensing Systems. Washington, D.C.: Government Printing Office Superintendent of Documents.

New York State Department of Motor Vehicles. 1975. Limited Driving Privileges For Problem Motorists. Albany, New York: Department of Motor Vehicles.

New York State Department of Motor Vehicles. 1977. Problem Driver Interview and Driver Safety Sessions. A Program Appraisal. Albany, New York: Department of Motor Vehicles.

Newbold, E. 1927. Practical applications of the statistics of repeated events, particularly to industrial accidents. Journal of the Royal Statistical Society Series A 90: 487-547.

O'Neall, P.A. 1975. An Evaluation of Two Group Interview and Two Letter-Contact Driver Improvement Programs. Olympia, Washington: Research and Technology Division, Department of Motor Vehicles.

Payne, S, Brownlea, A., and Hall, A. 1984. Evaluation of Queensland Defensive Driving Course. Nathan, Australia: Griffith University.

Peck, R.C. 1976. Toward a dynamic system of driver improvement program evaluation. Human Factors 18(5): 493-506.

Peck, R.C., and Kadell, D. 1983. California's Post-Licensing Control Reporting and Evaluation System -- A Summary of the First Three Years of Results. Washington, D.C.: National Highway Traffic Safety Administration.

Peck, R., Kelsey, S., Ratz, M., and Sherman, B. 1980. The effectiveness of accredited traffic violator schools in reducing accidents and violations. Journal of Safety Research 12(2): 68-77.

Peck, R.C., and Kuan, J. 1983. A statistical model of individual accident risk prediction using driver record, territory and other biographical factors. Accident Analysis and Prevention 15(5); 371-393.

Peck, R.C., McBride, R.S., and Coppin, R.S. 1971. The distribution and prediction of driver accident frequencies. Accident Analysis and Prevention 2: 243-299.

Perini, V.J., Jr. 1974. Driving Licensing Law: Help or hinderance? in: Future Role of Driver Licensing in Highway Safety, pp. 15-18. Special Report 151. Washington, D.C.: Transportation Research Board.

Pollock, W.T. (ed) 1975. Improving Driver Performance: Synopsis of a Research Colloquium. Ann Arbor, Michigan: Highway Safety Research Institute, The University of Michigan.

Prothero, J.C. 1978. Evaluation of an experimental treatment for problem drivers. Human Factors 20(4): 489-493.

Prothero, J.C., and Seals, T.A. 1978. Evaluation of educational treatment for rehabilitation of problem drivers. Transportation Research Record 672: 58-63.

Rahn, B.F. 1970. Sentencing the suspended or revoked driver. Traffic Digest and Review 18(6-7): 8-9.

Ratz, M. 1978. The Effects of a Traffic Safety Film or a Drive Test With Counseling Session for Renewal Drivers Licence Applicants with Poor Driver Records. Sacramento, California: Department of Motor Vehicles.

Reese, J.H. 1975. Legal issues in traffic offense adjudication. In: Report on Symposium on Effective Highway Safety Adjudication. Volume II, Denver University, pp. 109-125. National Highway Traffic Safety Administration technical report no. DOT-HS-801-780. Springfield, Virginia: National Technical Information Service.

Robinson, C.D. 1977. Operation of Driver Licence Disqualification as a Sanction. Melbourne, Australia: Department of Transport.

Ross, H.L. 1960. Traffic law violation: A folk crime. Social Problems 8: 231-241.

Ross, H.L. 1975. The effectiveness of drinking-and-driving laws in Sweden and Great Britain. In: Alcohol, Drugs and Traffic Safety. Proceedings of the Sixth International Conference on Alcohol, Drugs and Traffic Safety. (eds.) S. Israelstam and S. Lambert, pp. 663-678. Toronto: Addiction Research Foundation.

Salzberg, P.M., and Klingberg, C.L. 1977. A Supplemental Evaluation of the Defensive Driving Course as a Rehabilitative Component in the Special Adjudication for Enforcement (S.A.F.E.) Program. Olympia, Washington: Department of Licensing.

Salzberg, P.M., and Klingberg, C.L. 1978. Special Adjudication of Enforcement (SAFE). National Highway Traffic Safety Administration contract no. DOT-HS-343-3-682. Springfield, Virginia: National Technical Information Service.

Salzberg, P.M., Ryser, M.R., Nuse, R.H., and Paulsrude, S.P. 1985. Effectiveness of the Goal Setting Program: An Intervention For High Risk Drivers. Olympia, Washington: Department of Licensing.

Schlesinger, L.E., Bonato, R.R., and Marx, B.S. 1964. The computer, newest tool in driver improvement. Traffic Safety 64: 10-12.

Schuster, D.H. 1968. Prediction of follow-up driving accidents and violations. Traffic Safety Research Review 12: 17-21.

Schuster, D.H. 1969. Follow-up evaluation of the performance of driver improvement classes for problem drivers. Journal of Safety Research 1(2): 80-87.

Scott, B.Y., and Greenberg, H.M. 1968. Final Report on Effect of Group Sessions in Changing Driver Attitudes. Albany, New York: Department of Motor Vehicles.

Sherman, B., and Ratz, M. 1979. An Evaluation of Probation-by-Mail as an Alternative to Mandatory Hearing Attendance for Negligent Operators. Sacramento, California: Department of Motor Vehicles.

Shoham, S.G. 1974. Punishment and traffic offences. Traffic Quarterly 28(1): 61-73.

Simpson, H.M. 1985. Issues in traffic safety. Paper presented at the 22nd Annual Meeting of the Traffic Injury Research Foundation of Canada, 20 June 1985, Toronto, Ontario. Ottawa, Ontario: TIRF.

Simpson, H.M. 1986. New approaches to promoting highway safety. Paper presented to the International Medical Advisory Conference, 1 October 1986, Ottawa, Ontario. Ottawa, Ontario: The Traffic Injury Research Foundation of Canada.

Skinner, B.F. 1953. Science and Human Behavior. New York, NY: MacMillan.

Solomon, R.L. 1964. Punishment. American Psychologist 19(4): 239-253.

Staplin, L.K., and Knoebel, K.Y. 1985. Development of a Driver Improvement Index. Final Report. Harrisburg, PA.: Department of Transportation.

Stevenson, G.M. 1970. Problems in detection, identification and treatment. In: Drunk Driving Cases: Prosecution and Defense. (ed.) B. Freedman. New York: Practicing Law Institute.

Stewart, J.R., and Campbell, B.J. 1972. The Statistical Association Between Past and Future Accidents and Violations. Chapel Hill, North Carolina: University of North Carolina Highway Safety Research Center.

Tannahill, W.J., and Tarrants, W.E. 1982. Effectiveness and Efficiencies in Driver Licensing and Improvement. Evaluation Summary Report. National Highway Traffic Safety Administration technical report no. DOT-HS-806-136. Springfield, Virginia: National Technical Information Service.

Temple, A.F. and Ferguson, T.G. 1958. Safety Letter Survey. Texas: Department of Public Safety.

Timberlake, W.E. 1970. A Study of Procedures Used to Deter Driving While Under Revocation and Suspension. Evanston, Illinois: Traffic Institute, Northwestern University.

Tofany, V. 1975. Political and economic barriers to change in highway safety and accident prevention. In: Report on Symposium on Effective Highway Safety Adjudication. Volume II, Denver University, pp. 103-107. Springfield, Virginia: National Technical Information Service.

Traffic Injury Research Foundation of Canada. 1986. Development of an Evaluation Plan for IMPACT. Interim Report. Edmonton, Alberta: Alberta Alcohol and Drug Abuse Commission.

Ulmer, R.G. 1978. State of Rhode Island Special Adjudication for Enforcement - Volume II: Evaluation of Driver Retraining Schools. Analytic Study. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-803-586. Springfield, Virginia: National Technical Information Service.

U.S. Department of Transportation and American Association of Motor Vehicle Administrators. 1986. State and Province Licensing Systems: Comparative Data. Washington, D.C.: AAMVA.

Waller, P.F. 1974. The changing task of driver licensing. in: Future Role of Driver Licensing in Highway Safety, pp. 45-48. Special Report 151. Washington, D.C.: Transportation Research Board.

Waller, P.F., Hull, R.G., and Padgett, S.S. 1977. The North Carolina Test Wavier Law: An Evaluation of its Impact. Final Report. Chapel Hill, North Carolina: University of North Carolina Highway Safety Research Center.

Weidman, J.R., Simone, G.A., and McKnight, A.J. 1982a. Development of a Driver Improvement System for Traffic Violators. Volume I - Developmental Research. National Highway Traffic Safety Administration technical report no. DOT-HS-806-245. Springfield, Virginia: National Technical Information Service.

Weidman, J.R., Simone, G.A., and McKnight, A.J. 1982b. Development of a Driver Improvement System for Traffic Violators. Volume II - Program Materials. National Highway Traffic Safety Administration technical report no. DOT-HS-806-246. Springfield, Virginia: National Technical Information Service.

Wholey, J.S. 1977. Evaluability assessment. In: Evaluation Research Methods: A Basic Guide, (ed.) L. Rutman, pp. 41-56. Beverly Hills, California: Sage Publications.

Wilde, G.J.S. 1975. Road user behaviour and traffic safety: Toward a rational strategy of accident prevention. Paper presented at the Annual Convention of the Dutch Road Safety League, 26 April 1975, Amsterdam, The Netherlands. Kingston, Ontario: Queen's University.

Wilde, G.J.S. 1976. The risk compensation theory of accident causation and its practical consequences for accident prevention. Paper presented to the Annual Meeting of the Osterreichische Gesellschaft, 7-9 October 1976, Salsburg, Austria. Kingston, Ontario: Queen's University.

Wilde, G.J.S. 1982. The theory of risk homeostasis: Implications for safety and health. Risk Analysis 2(4): 209-226.

Wilde, G.J.S., Claxton-Oldfield, S.P., and Platenius, P.H. 1985. Risk homeostasis in an experimental context. In: Human Behavior and Traffic Safety, (eds.) L. Evans and R.C. Schwing, pp. 119-142. New York: Plenum Press.

Wilde, G.J.S., and Murdoch, P.A. 1981. Incentive systems for accident-free and violation-free driving in the general population. Paper presented at the International Conference on Road Safety, University of Wales, Institute of Science and Technology, Cardiff, Wales, 7-11 September 1981. Kingston, Ontario: Queen's University.

Willett, T.C. 1973. Drivers After Sentence. London: Heinemann.

Williams, B.B. 1979. Point System Comparison. Traffic Laws Commentary 8(2).

Williams, R.L., and Hagen, R.E. 1981. Evaluation of Three Alternative Formats for Probation Violator Hearings. Sacramento, California: Department of Motor Vehicles.

Williams, R.L., Hagen, R.E., and McConnell, E.J. 1984. A driving record analysis of suspension and revocation effects on the drinking-driving offender. Accident Analysis and Prevention 16(5/6): 333-338.

Wolpe, J., Salter, A., and Reyna, L.J. (eds.) 1964. The Conditioning Therapies--The Challenge in Psychotherapy. New York, NY: Holt, Rinehart and Wiston.

Wooton, P., Carpenter, D.W., and Peck, R.C. 1981. Post Licensing Control Reporting and Evaluation System: Negligent Operator Program Costs and Effectiveness Status Report #7. Sacramento, California: Department of Motor Vehicles.

Wynne-Jones, J.D. 1984. Do defensive driving courses really reduce accidents? In: Road Traffic Safety Seminar. Seminar Papers. Volume 1. Wellington, New Zealand: Traffic Research Section, New Zealand.

APPENDIX A
OTHER RESOURCE MATERIALS

Abrahamson, D. 1983. Driving in your right mind. Car and Driver 29(1): 6.

American Association of Motor Vehicle Administrators. 1979. Involvement of Suspended/Revoked Drivers in Traffic Crashes - A Statement of the Problem. National Highway Traffic Safety Administration technical report no. DOT-HS-804-104. Springfield, Virginia: National Technical Information Service.

Arnold, D., and Fleissner, D. 1979a. Special Adjudication for Enforcement (Safe). Executive Summary. National Highway Traffic Safety Administration technical report no. DOT-HS-805-304. Springfield, Virginia: National Technical Information Service.

Arnold, D., and Fleissner, D. 1979b. Special Adjudication for Enforcement (Safe). Volume I. National Highway Traffic Safety Administration technical report no. DOT-HS-805-305. Springfield, Virginia: National Technical Information Service.

Arnold, D., and Fleissner, D. 1979c. Special Adjudication for Enforcement (Safe). Volume II. National Highway Traffic Safety Administration technical report no. DOT-HS-805-306. Springfield, Virginia: National Technical Information Service.

Australian Transport Advisory Council. 1980. Guidelines For Driver Licensing and Driver Improvement Programs in Australia. Australia: Australian Transport Advisory Council, Advisory Committee on Road User Performance and Traffic Codes.

Beamish, J.J., and Malfetti, J.L. 1962. A psychological comparison of violator and non-violator automobile drivers in the 16-19 year age group. Traffic Safety Research Review 6: 12-15.

Brown, E., Carpenter, D.W., Furtado, B.F., Lindholm, K.H., and Gates, L. 1979. Development of a Provisional Licensing Program for New California Drivers. Sacramento, California: Division of Drivers License and Research and Development Section, Department of Motor Vehicles.

Campbell, B.J. 1958. Driver Improvement: The Point System. Chapel Hill, NC: University of North Carolina, Institute on Government.

Campbell, B.J. 1959. The effects of driver improvement actions on driving behaviour. Traffic Safety Research Review 3: 319-331.

Campbell, D.T. 1969. Reforms as experiments. American Psychologists 24: 409-429.

Canadian Conference of Motor Transport Administrators. 1976. A Report on the Effectiveness of Driver-License Suspensions. Ottawa, Ontario: Canadian Conference of Motor Transport Administrators.

Chalfant, M.W. 1958. The effectiveness of driver improvement procedures. National Safety Congress Transactions 28: 74-79.

Chapman, R.L. 1970. Improving driver licensing programs. Behavioral Research in Highway Safety 1(3): 172-179.

Clark, L.W. 1967. California driver improvement course cuts traffic infraction and accident toll. Traffic Digest and Review 11-15.

Conger, J., Miller, W., and Rainey, R. 1966. Effectiveness of driver education: the role of motivation, intelligence, social class, and exposure. Traffic Safety Research Review 10: 67-71.

Coppin, R.S. 1961. Control of the Negligent Operator, Part I. Characteristics of Negligent Drivers. Report No. 8. Sacramento, California: Department of Motor Vehicles.

Coppin, R.S. 1981. Driver Improvement in California. Victoria, Australia: Road Safety and Traffic Authority.

Coppin, R.S., and Samuels, I. 1961. Control of the Negligent Driver, Part I. Characteristics of Negligent Drivers. Report No. 8. Sacramento, California: Department of Motor Vehicles.

Croke, J.A., and Wilson, W.B. 1977. Model for Provisional (Graduated) Licensing of Young Novice Drivers. National Highway Traffic Safety Administration technical report no. DOT-HS-802-313. Springfield, Virginia: National Technical Information Service.

Damron, F., Perrone, P.A., and Hosford, R.E. 1971. The effect of different traffic court school instructional approaches on driver attitude and behaviour. Traffic Digest and Review 19(6): 1-9.

Delain, G.E. 1968. Evaluation and Development of Driver Improvement Clinics. New York: Department of Motor Vehicles.

Denver University. 1975a. Report on Symposium on Effective Highway Safety Adjudication. Volume 1. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-801-779. Springfield, Virginia: National Technical Information Service.

Denver University. 1975b. Report on Symposium on Effective Highway Safety Adjudication. Volume II. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-801-780. Springfield, Virginia: National Technical Information Service.

DeSilva, H. 1939. Automobile drivers can be improved. Psychological Bulletin 36: 284-285.

DeSilva, H., and Channell, R. Driver clinics in the field. Journal of Applied Psychology 22(1): 50-69.

DeSilva, H., and Forbes, T.W. 1938. Improving bad drivers. Safety Engineering June.

Department of Transportation. 1976. Special adjudication for enforcement (SAFE). News 2.

Edwards, M.L., and Ellis, N.C. 1976. An evaluation of the Texas driver improvement training program. Human Factors 18(4): 327-333.

Fazakerley, J.A., Davies, R.F., Henderson, R., and Sheppard, D. 1980. Evaluation of Better Driving Courses Run by Police Forces for the Public. Berkshire, England: Transport and Road Research Laboratory.

Forbes, T.W. 1981. Human Factors in Highway Traffic Safety Research. Malabar, Florida: Kriega (Robert E) Publishing Company.

Fuchs, C. 1980. Wisconsin Driver Improvement Program: A Treatment-Control Evaluation. Chicago, Illinois: National Safety Council.

Fuchs, C., and Pong, H. 1979. Evaluation of the Wisconsin Driver Improvement Program. Executive Summary. Wisconsin: Department of Transportation, Division of Motor Vehicles.

Goldstein, L.G. 1969. Improvement of drivers through original licensing means. National Safety Congress 59: 52-54.

Gorys, P., Pang, H.C., and Rosenbaum, R.M. 1983. Preliminary Evaluation of the Probationary Driver Program in Ontario. Toronto, Ontario: Ministry of Transportation and Communications.

Green, J.A., Lehner, P.E., and Ford, C.R. 1980. Estimation of the Coverage of New Programs Based on Driver Incident Data. Report no. UM-HSRI-80-7. Ann Arbor, Michigan: Highway Safety Research Institute.

Haddon, W. Jr., Suchman, E.A., and Klein, D. 1964. Accident Research Methods and Approaches. New York: Harper & Row.

Hagen, R.E. 1977. Effectiveness of License Suspension or Revocation for Drivers Convicted of Multiple Driving-Under-The-Influence Offenses. Sacramento, California: Department of Motor Vehicles.

Harano, R.M. 1974. The Psychometric Prediction of Negligent Driver Recidivism. Sacramento, California: Department of Motor Vehicles.

Harano, R.M., McBride, R.S., and Peck, R.C. 1973. The Prediction of Accident Liability Through Biographical Data and Psychometric Tests. Final Report No. 39. Sacramento, California: Department of Motor Vehicles.

Harrington, D.M., and McBride, R.S. 1970. Traffic Violations by Type, Age, Sex and Marital Status. Research Report No. 34. Sacramento, California: Department of Motor Vehicles.

Hebert, F.T., Flimer, S.H., and Tharp, P.A. 1984. Study of the Effects of Administration Per Se Implementation in Oklahoma. Normon, Oklahoma: University of Oklahoma, Bureau of Government Research.

Henderson, H.L., and Kole, T. 1963a. The contributions of New Jersey accident prevention clinics through accident reduction and knowledge of motorists' characteristics. Aspects Techniques de la Securite Routiere 16: 5.1-5, 17.

Henderson, H.L. and Kole, T. 1963b. Progress Report: Mass Communication and Group Discussion Techniques. New York: Driver Safety Service.

Hole, G. 1982. The Norwegian compulsory driver improvement program. In: Proceedings of the Workshop on Driver Improvement. Bern, Switzerland: Schweizerische Berntungsstelle fur Unfallverhutung.

Horner, J. 1958. How New Jersey's clinics cure problem drivers. Traffic Safety 52(5): 10-17.

House, E.G., and Waller, P.F. 1970. Driver Improvement Measures: An Evaluation Based on Conviction and Crash Records. Chapel Hill, North Carolina: Highway Safety Research Center, University of North Carolina.

Hyle, P.S. 1984. Maryland's provisional license program. Journal of Traffic Safety Education 31(2): 7.

Institute of Government. 1970. Punishment for Motor Vehicle Offenses. Chapel Hill, North Carolina: University of North Carolina, Institute of Government.

Johnson, H.M. 1939. Evidence for educational value in drivers' clinics. Psychological Bulletin 36: 674-675.

Johnson, H.M. 1964. The detection and treatment of accident prone drivers. Psychological Bulletin 43(6).

Johnson, H.M., and Cobb, P.W. 1938. The educational value of drivers' clinics. Psychological Bulletin 35: 758-760.

Kelsey, S.L. 1983. License Extension for Clean-Record Drivers: A Four-Year Follow-Up. Sacramento, California: Department of Motor Vehicles.

Liner, S.A. 1979. State laws on probationary licensing of minors. Traffic Law Commentary 8(3): 1-22.

McBride, R.S. 1970. Prediction of driving behaviour following a group driver improvement session. Journal of Applied Psychology 54(1): 45-50.

McBride, R.S. 1967. The Measurement of Warning Letters on Two Dimensions: Threat and Intimacy. Unpublished Master's Thesis. Sacramento, California: State College.

McBride, R.S., and Peck, R. 1969. Modifying Negligent Driver Behaviour Through Warning Letters. Report No. 30. Sacramento, California: Department of Motor Vehicles.

McConnell, E.J., Hagen, R.E., and Peck, R.C. 1980. Design and Evaluation of a Crash Prediction Strategy Report 76. National Highway Traffic Safety Administration contract no. OTS-057802. Springfield, Virginia: National Technical Information Service.

McKenna, F.P. 1982. The human factor in driving accidents. An overview of approaches and problems. Ergonomics 25(10): 867-877.

McKnight, A.J., and Katz, D.B. 1982. Presenting Safety Information to Traffic Violators. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-806-386. Springfield, Virginia: National Technical Information Service.

Mollenkott, K. 1980. Withdrawal of driving license: Measure of safety and rehabilitation or secondary sentence? End of a discussion. Blutalkohol 17: 367-370.

Molise, R.B., Davis, D.D., Hensley, R., Bradley, S., Steuben, W., Wootton, P., Marsh, W.C., and Becker, M. 1982. A Recommended Provisional Licensing System for California. Sacramento, California: Division of Driver Safety and Licensing, Department of Motor Vehicles.

Myrick, R. 1963. Driver improvement clinic induces attitude change by group discussion. Traffic Digest and Review 9-11.

National Highway Traffic Safety Administration. 1980. Provisional Licenses for Youthful Novice Drivers. Washington, D.C.: Government Printing Office Superintendent of Documents.

National Highway Traffic Safety Administration. 1982. Driver Improvement System for Traffic Violators. Washington, D.C.: Government Printing Office Superintendent of Documents.

National Safety Council. 1965. Driver Licensing, Improvement and Control Data. Chicago, Illinois: National Safety Council Traffic Department Inventory Division.

National Safety Council. 1983. Third Symposium on Traffic Safety Effectiveness (Impact) Evaluation Projects. Chicago, Illinois: National Safety Council.

New York State Department of Motor Vehicles. 1974. Review of Experimental Driver Rehabilitation Programs. Albany, New York: Department of Motor Vehicles.

New York State Department of Motor Vehicles. 1978. An Interim Evaluation of the New York State Alcohol and Drug Rehabilitation Program. Albany, New York: Department of Motor Vehicles.

New York State Department of Motor Vehicles. 1980. Traffic and Pedestrian Education System (Tapes). Albany, New York: Department of Motor Vehicles.

O'Neall, P.A. 1976. Evaluation of Two Driver Improvement Group Interview Programs: Second Interview. Olympia, Washington: Research and Technology Division, Department of Motor Vehicles.

O'Neall, P., and McKnight, K. 1970. Effectiveness of Individual and Group Driver Improvement Interviews. Report No. 027. Olympia, Washington: Department of Motor Vehicles.

Owens, C.M. 1967. Report on a three-year controlled study of the effectiveness of the Anaheim Fullerton municipal court driver improvement school. Municipal Court Review 7(2): 7-14.

Peck, R.C. 1968. The Prediction of Driver Behaviour Subsequent to Receipt of Official Letters of Reprimand. Unpublished Master's Thesis. Sacramento, California: State College.

Peck, R.C., and Harano, R.M. 1975. State Driver Improvement Analysis: Driver Improvement Literature Review (Task 1). Contract No. DOT-HS-4-00967. Sunnyvale, California: Public Systems Inc.

Planek, T., Schupack, S., and Fowler, R. 1974. An evaluation of the National Safety Council's Defensive Driving Course in various states. Accident Analysis and Prevention 6: 271-97.

Proffitt, S., Richardson, P., and Angele, K. 1982. The Administration of the Virginia Driver Improvement Act. Virginia: Division of Motor Vehicles, Planning and Program Development.

Rhoads, M.D. 1977. An educator's viewpoint of driver improvement schools. Journal of Traffic Safety Education 24(2): 29-30.

Road Traffic Safety Research Council. 1976. An evaluation of the defensive driving course in New Zealand. In: Proceedings of the Traffic Safety Research Seminar p.p. 125-139 Wellington, New Zealand: Road Traffic Safety Research Council.

Robinson, C.D. 1979. Reasons for driving while disqualified. Accident Analysis and Prevention 11(4): 307-310.

Ross, H.L. 1982. Deterring the Drinking Driver. Legal Policy and Social Control. Lexington, MA: Lexington Books, D.C. Heath and Company.

Salzberg, P., and Klingberg, C. 1983. The Effectiveness of Deferred Prosecution for Driving While Intoxicated. Journal of Studies on Alcohol 44(2).

Santa-Barbara, J., McDonald, J., and Clifford, L.V. 1981. Ontario Drivers' Knowledge of and Attitudes Toward the Demerit Point System. Toronto, Ontario: Research and Development Branch, Ministry of Transportation and Communications.

Schechter, A. 1977. Israelis improve driver behaviour with program of personal communication. Traffic Safety April.

Schmidt, L., and Schuetzenhoefer, A. 1977. Driver Improvement. Improvement of the Driving Behaviour of Irresponsible Drivers. Current Experience and Theoretical Basis (First Report). Vienna, Austria: Road Safety Board.

Schoolfied, L.M. 1980. Analysis of the Point System Used in the Driver License Division, Department of Public Safety State of Utah. Utah: Department of Public Safety.

Schuster, D.H. 1971. A two-year follow-up of official action taken against problem drivers. In: Proceedings of the 79th Annual Convention of the American Psychological Association, 505-506. Washington, D.C.: American Psychological Association.

Schuster, D.H. 1974. The effectiveness of official action taken against problem drivers: A five year follow-up. Journal of Safety Research 6(1): 171-176.

Schuster, D.H., and Guilford, J.P. 1962. The psychometric prediction of problem drivers. Traffic Safety Research Review 6: 16-20.

Smith, M. 1983. Review of NHTSA education research. Journal of Traffic Safety Education 30(2): 23-25.

Smye, M.D., MacLeod-Weeks, P., and Clifford, L.V. 1980. Evaluation of the Nine Demerit Point Counselling Interview. Toronto, Ontario: Ministry of Transportation and Communications.

State of Utah. 1976. A Program Audit of Driver Control and Driver Improvement Programs in the State of Utah. Salt Lake City, Utah: Office of the Legislative Auditor General.

Tillmann, W.A., Harris, L.H., Phipps, M.A., and Howe, J.L. 1964. Group Therapy Amongst Persons Involved in Frequent Automobile Accidents. Toronto, Ontario: Department of Transport.

The Transportation Center, University of Saskatchewan. 1976. A Report on the Effectiveness of Driver-License Suspensions. Ottawa, Ontario: Canadian Conference of Motor Transport Administrators.

Van Wyk, D.H. The efficacy of present traffic laws. Robot 82: 2-6.

Vong, H.W., Heinrich, H.C., Klebe, W., Kroj, W., Spoerer, E., Walther, R., Winkler, W., and Wuhrer, H. 1978. Courses for Drivers Who Commit Offences. Model Tests Carried Out in Federal Germany. Cologne, West Germany: Federal Institute of Road Research.

Wallace, J.E. 1969. Problem Drivers: An Evaluation of Four Treatment Programs and the Use of Questionnaire Material for Predicting Success. Report No. 26. Olympia, Washington: Department of Motor Vehicles.

Waller, P.F. 1976. Evaluation of the North Carolina Habitual Offender Law. Chapel Hill, North Carolina: Highway Safety Research Centre, University of North Carolina.

Waller, P.F., and Reinfurt, D.W. 1973. The Who and When of Accident Risk: Can Driver License Programs Provide Countermeasures. Chapel Hill, North Carolina: Highway Safety Research Centre, University of North Carolina.

Weiers, R.M. 1977. An experimental study of the defensive driving course. Transportation Research Record 629: 56-62.

Whittenburg, J.A., and Baker, G.L. 1977. A Follow-Up Evaluation of Three Classroom - Range Driver Improvement Training Programs: 1970-1974. Final Report. National Highway Traffic Safety Administration technical report no. DOT-HS-802-587. Springfield, Virginia: National Technical Information Service.

Whittenburg, J.A., Pain, R.F., McBride, R., and Amide, J. 1972. Driver Improvement Training and Initial Development. National Highway Traffic Safety Administration technical report no. DOT-HS-800-680. Springfield, Virginia: National Technical Information Service.

APPENDIX B

PROJECT OVERVIEW: INFORMATION GATHERING

PROJECT OVERVIEW

Information on past and recent developments in the area of driver improvement was obtained by means of (1) a search of published literature and (2) a survey of government agencies responsible for driver licensing and improvement as well as organizations/individuals expert in the area in North America and abroad. These activities are described below.

Literature Search

The identification and collection of literature initially involved a search of the library holdings of the Traffic Injury Research Foundation, the Ontario Ministry of Transportation and Communications, and the University of Michigan Transportation Research Institute. Computer searches were also made of several specialized databases:

- Transportation Research Information System (TRIS-DIALOG file 63);
- Canadian Transportation Documentation System (CTDS); and
- National Technical Information Service (NTIS).

Documents identified for review in this study were obtained from the above sources, the original publishers, or in the case of some U.S. government reports, from Information on Demand, Inc., Berkeley, California.

Survey

As part of our information-gathering activities, we contacted government agencies, other organizations, and individuals active in the field of driver improvement to request their assistance. For example, we contacted the Governor's Highway Safety Representative in each of the United States and asked them to provide information on driver-improvement programs or, alternatively, to forward our request to those persons

more directly responsible for driver-improvement programs in their jurisdiction. The following persons responded to our inquiry:

Jay N. Dulany
Chief Driver Improvement Specialist
Driver Improvement Bureau
Division of Motor Vehicles
Alaska Department of Public Safety
401 E Northern Lights Blvd.
Anchorage, Alaska
99503

Karl Batroff
Acting Manager
Safety/Driver Responsibility Group
Motor Vehicle Division
Arizona Department of Transportation
1801 West Jefferson Street
P.O. Box 2100
Pheonix, Arizona
85001

Joyce Patterson
Manager
Planning and Programming
Arkansas Highway Safety Program
#1 Capital Mall Level 4B
Suite 215
Little Rock, Arkansas
72201

Rod Girdler
Driver Control Hearing Officer
Arkansas Department of
Finance and Administration
P.O. Box 1272
Little Rock, Arkansas
72203

Barbara DeHart-Reed
Highway Safety Specialist
Division of Highway Safety
Colorado Department of Highways
4201 East Arkansas Avenue
Denver, Colorado
80222

Richard D. Georgeson
Motor Vehicle Administrator
Driver Control and Traffic Records
Motor Vehicle Division
Colorado Department of Revenue
140 West 6th Avenue
Denver, Colorado
80204-5195

D.H. Keirn
Chief, Bureau of Driver Improvement
Florida Department of
Highway and Motor Vehicles
Tallahassee, Florida
32301

Minuard C. McGuire
Director
Governor's Office of Highway Safety
959 East Confederate Ave., S.E.
P.O. Box 1497
Atlanta, Georgia
30301

Jane Caviness
Manager, Driver Services Section
Motor Vehicle Bureau
Idaho Transportation Department
P.O. Box 34
Boise, Idaho
83731-0034

Larry F. Wort
Chief
Bureau of Safety Programs
Division of Traffic Safety
Illinois Department
of Transportation
2300 South Dirksen Parkway
Springfield, Illinois
62764

Joseph P. Rockford
Director
Driver Services Department
Office of the Secretary of State
Springfield, Illinois
62723

Charles D. Loos
Chief, Division of Traffic Safety
Room 801, State Office Building
Indiana Department of Highways
100 North Senate Avenue
Indianapolis, Indiana
46204

M.V. Mickelson
Manager, Driver Safety
and Improvement
Iowa Department of Transportation
Lucas State Office Building
Des Moines, Iowa

Gary Brunker
Highway Safety Standards Branch
Kentucky State Police
919 Versailles Road
Franfort, Kentucky
40601

Albert L. Godfrey, Sr.
Governor's Highway Safety
Representative
Maine Department of Public Safety
36 Hospital Street
Augusta, Maine
04330

Howard R. Showe
Assistant Director
Division of Driver Control
and Records
Motor Vehicle Administration
Maryland Department
of Transportation
6601 Ritchie Highway, N.E.
Glen Burnie, Maryland
21062

Edith J. Platt
Inspector Supervisor
Driver Improvement/Education
Massachusetts Registry
of Motor Vehicles
100 Nashua Street
Boston, Massachusetts
02114

Homer N. Smith
Director
Bureau of Driver Improvement
Michigan Department of State
State Secondary Complex
7064 Crowner Driver
Lansing, Michigan
48918

Nathan B. Walker
Director
Division of Highway Safety
Missouri Department of Public Safety
P.O. Box 749
8th Floor
Truman State Office Building
Jefferson City, Missouri
65102-0749

Clarence W. Mosher
Director
Division of Traffic Safety Records
New York Department
of Motor Vehicles
The Governor Nelson A. Rockefeller
Empire State Plaza
Albany, New York
12228

Alfred J. Frakes
Director
Driver Licensing Services
New York Department
of Motor Vehicles
The Governor Nelson A. Rockefeller
Empire State Plaza
Albany, New York
12228

Frank J. Conley
Director of Research and Development
New York Department
of Motor Vehicles
The Governor Nelson A. Rockefeller
Empire State Plaza
Albany, New York
12228

Joe Carlson
Assistant Director
Drivers License and
Traffic Safety Division
North Dakota State Highway Department
600 East Boulevard Avenue
Bismark, North Dakota
58505-0178

Ralph W. Graves
Governor's Representative
Oklahoma Highway Safety Office
200 N.E. 21st Street
Oklahoma City, Oklahoma
73105

Alvin R. Luedecke
Administrator
Traffic Safety Section
Texas State Department of Highways
and Public Transportation
Austin, Texas
78701-2483

George Griffin
Chief, Driver and Vehicle Records
Texas State Department
of Public Safety
Box 4087
Austin, Texas
78773

Larry E. Lunnen
Director
Utah Highway Safety Division
Driver License-Driver
Improvement and Control
Utah Department of Public Safety
4501 South 2700 West
Salt Lake City, Utah
84119

U.J. Sartorelli
Assistant Director
Governor's Highway Safety Program
Vermont Agency of Transportation
133 State Street
Administration Building
Montpelier, Vermont
05602

William H. Conway, Jr.
Commissioner
Vermont Agency of Transportation
Department of Motor Vehicles
120 State Street
Montpelier, Vermont
05603-0001

Dan W. Byers
Manager
Driver Improvement Division
Virginia Department
of Motor Vehicles
2300 West Broad Street
P.O. Box 27412
Richmond, Virginia
23269

Marvin R. Ryser
Administrator
Driver Improvement Division
Washington Department of Licensing
Highways-Licenses Building
Olympia, Washington
98504

Contacts with several agencies and individuals were established by telephone (and, in some instances, in person) to discuss current and planned activities in the area of driver improvement. They included the American Association of Motor Vehicle Administrators; the Canadian Conference of Motor Transport Administrators; the California Department of Motor Vehicles; the National Highway Traffic Safety Administration; the Bureau of Driver Licensing in Pennsylvania; The Transportation Research Group at Ketron, Inc. in Pennsylvania; the Highway Safety

Research Center at the University of North Carolina; and the Road Traffic Authority in Victoria, Australia. Agencies and individuals identified above were particularly helpful in identifying additional key documents and in describing recent initiatives in the field of driver improvement.